RAILROAD GAZETTE

FRIDAY, AUGUST 6, 1897.

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Changes in Operating Divisions of the Chicago Great Western.

A letter from the General Manager of the Chicago Great Western describes the changes in the operating divisions recently put into effect on that road.

"Owing to the peculiar location of our lines the junction at Oelwein, Ia., is practically the center of the system from which the three main lines run to Minneapolis, Chicago and Kansas City. Heretofore we have had three division superintendents in charge of transportation matters as follows: One located at Chicago, whose jurisdiction extended from Chicago to Dubuque; one located at Oelwein, whose jurisdiction extended from Dubuque to Minneapolis, including the Lyle, Waverly and Mantorville branches and one located at Des Moines, whose jurisdiction extended from Oelwein to Kansas City. Since appointing the Division Superintendents we have inaugurated a system of giving the agent at large stations entire jurisdiction over the station yard, yardmen, enginemen, and in one instance his jurisdiction extends to the traffic department. At the present time Kansas City, St. Joseph, Des Moines and Chicago are handled in this manner, and as these agents report direct to the General Superintendent it relieves the division superintendents of some of the most important work.

"Under our present plan the Superintendent of Transportation will be located at Oelwein and have entire charge over movement of trains, supplying cars and, in fact, all matters relating to transportation proper on the entire system. All of the train dispatchers will be located at Oelwein under the authority of the Superintendent of Transportation, and the force will be divided as follows: One Chief Dispatcher for the line between Minneapolis and Chicago, including branches, and one Chief Dispatcher for the line Oelwein to Kansas City, both day men, and one Chief Dispatcher to have charge of the entire line at night. Heretofore we have had dispatchers at Oelwein, Chicago and St. Joseph. Under the new arrangement the dispatching for the Chicago Division is handled by means of an overland wire from Dubuque to Oelwein and the dispatching of the St. Joseph and Kansas City Divisions by means of an overland wire from Des Moines to Oelwein.

"The office of Division Superintendent has been abolished and all agents report directly to the General Superintendent at St. Paul. The time of train and enginemen will be kept in his office and excepting at large stations, station payrolls will be made there.

"The Superintendent of Transportation has as assistants four train supervisors. These men have been selected from the Mechanical Department in order that they could perform the duties of traveling engineers, but in addition they perform the duties of train-masters. They are on the road continually, and in addition to making reports and recommendations regarding the train and engine service, they report and make recommendations regarding stations, yards, needed improvements, etc.

"The following are the appointments and changes under the new arrangement which goes into effect Aug. 1.

"J. Berlingett, formerly Assistant General Superintendent, is appointed Superintendent of Transportation, with office at Oelwein, and the office of Assistant General Superintendent has been abolished.

"J. A. Kelly, formerly Superintendent of the Chicago Division, with office at Chicago, has been appointed General Superintendent's Assistant, with office at St. Paul, with no specific duties, but will perform such duties as may be assigned to him.

"J. C. Ford, formerly Superintendent of the Dubuque and St. Paul Divisions, will remain at Oelwein as General Superintendent's Assistant, and will devote most of his time to traveling on the road inspecting the smaller stations, instructing agents in their duties, making recommendations for improvements, etc.

"B. F. Egan, formerly Superintendent of the Des Moines, St. Joseph and Kansas City Divisions, with office at Des Moines, has been appointed agent at St. Joseph and will have entire charge of the station, yard and terminals at that point.

"T. D. Tuohy, who has been Local Freight Agent at Chicago for a number of years, will retain the same title, but his jurisdiction will extend as far west as Forest Home and include the yards, yardmen, enginemen, trainmen; in fact he will have entire charge of the operating department of the Chicago Terminals."

Electric Traction for the South Side Elevated, Chicago.

At Schenectady, on July 26, a trial was made on the experimental track of the General Electric Co. of a new system of electric traction, the invention of Mr. Frank J. Sprague. The experimental train was composed of six cars from the South Side Elevated, of Chicago. These cars are fitted with McGuire trucks, each of which carries two 50-H. P. motors. Each car is provided with the new multiple unit system of control, whereby the controlling mechanism of the motors can be operated by a single lever. Moreover, this new method is such that all the motors on the train are controlled simultaneously when the train is made up, the same as a single car, the arrangement being such that the controlling mechanisms on all the cars can be operated by the movement of a single handle on the platform of any car, whether it be the first, the last or one in the middle of the train. This is accomplished by cable connections between the cars. These connections are coupled when a train is made up somewhat as are the steam and air pipes.

The controlling mechanisms are placed under the seats in five cars of the train, while in the other car it is carried inside the hood over one of the platforms. The levers, by any one of which the controlling mechanisms can be operated, are placed on the platform at each end of every car. The details of the method and mechanism by which a movement of any of the levers operates the controlling mechanism on each of the cars have not yet been made public. The lever turns vertically in either direction over the face of a circular box, about 6 in. diameter, which is carried on an upright tube. A motion of this lever in one direction or the other gives a forward or backward motion to the train, the speed of which depends upon the degree of arc through which it is turned and the time of contact. When the operator lets go of the controlling lever, it assumes a position in which all power is cut off from the train.

Each car takes the electric energy for its motors from feeder and return rails alongside the track by shoes, one of which is fastened to each truck. Thus, each car is independent of the others in regard to its supply of energy. The train is lighted by electricity and is to be electrically heated. It is also fitted with Westinghouse air-brakes, an engineer's valve and an air gage being on every platform near the operator's lever, the whole taking up little or no room. Air is supplied by a Standard automatic compressor on each car.

The trial was considered a success, the train making good speed and being handled with ease.

Rope Transmission.*

Leaving out of consideration the use of wire rope, which has a limited application, there are two general ways of transmitting power by rope, usually known as the 'English System" and the "American System."

The English system, probably so known from its extensive employment in the mills and factories of England, has been in common use for a great many years and there are many notable drives of the kind in this country, particularly in New England mills and in street railway power houses. The driving and driven pulleys are grooved and the power is transmitted by as many independent endless ropes as may be necessary. The weight of the ropes is depended upon to give the necessary adhesion in the grooves. Almost universal practice seems to have adopted the angle of 45 degrees for the sides of the groove as giving a sufficient grip for practical purposes, without undue tendency to squeeze the rope out of shape. With 45 degrees or with even a sharper angle, there is no appreciable disposition on the part of the ropes to stick in the grooves and follow the sheaves.

The English, or separate rope, system has certain disadvantages which are largely overcome in the American plan. Owing to the practical impossibility of getting all the ropes of precisely the same length, some of them are always doing more than their proper share of the work. This tends to stretch them and reduce their diameter, causes a differential action and slipping, all of which operates to wear out the ropes. Various devices have been resorted to to equalize the strain on the ropes, one of the simplest being the use of grooves having slightly curved instead of straight sides. This makes the angle of the groove different at every point and equalizes the grip of the ropes which lie higher or lower in the groove according to their variations in diameter. In designing drives by this system a liberal allowance has to be made for the certainty that the power is not going to be uniformly borne by the ropes, and, furthermore, that each rope is weakened by a splice. This places the separate rope system at a disadvantage in the matter of first cost of the installation. While the splice is not of necessity a cause of trouble, it is more liable to give trouble than any other part of a transmission, and the multiplication of them in this system is not a desirable feature.

The American system to all practical purposes overcomes the difficulties cited above. One continuous rope is employed, wound spirally back and forth, around driving and driven sheaves as many times as necessary, one of the wraps in its course being taken around a tension carriage or tightner. The tension carriage is automatic in its action and is to the system what the governor is to an engine. It insures a uniform amount of work being performed by each wrap of the rope, and is properly weighted to give the desired driving force and to take care of the variations in length due to changes in temperature, moisture, etc.

The sheaves used in this system are grooved, the general angle being 45 degrees. As a matter of practice it will be observed that these are far from being so deep as in the English system; that is, the ridges between the grooves ordinarily project but a little above the pitch line, or line of contact with the rope, instead of coming some little distance beyond or outside the ropes. This may be noteworthy as bearing silent testimony to which system operates the more smoothly, as in a properly designed transmission there should be no need of a deep groove to keep the ropes from jumping out. It is of the utmost importance that all of the grooves in a sheave should be exactly alike and of the same exact circumference; otherwise there will be a differential action set up between the ropes. Manufacturers who make a specialty of rope transmissions should have special gages and devices for calipering and measuring the circumference of the grooves to insure this accuracy.

The diameters of the sheaves should always be as large as convenient; it is very poor economy to reduce the first cost of a drive by using small sheaves. Forty diameters of the rope should be the rule, and 30 diameters the minimum size. It is well to observe as nearly as possible the same proportions for idlers. To insure the sheaves keeping up to the full speed of the rope they should have the V-shaped groove. Round grooves, in which the rope bottoms, are often used, but there is apt to be more or less slipping with these, especially in starting up, and consequent abrasion.

Various methods have been employed in the manufacture of sheaves, the object sought being to obtain perfectly true, uniform and smooth grooves, with the minimum machining, or without any at all. Wooden grooved sheaves have been used to a very considerable extent, and been discredited; casting the grooves in chills gave great promise, but was abandoned after a a costly series of experiments; corrugated steel rims have been tried; and an excellent sheave has been made or "built up" of separate grooved rings bolted together, as many of the rings as necessary having arm and hubs, and being really complete single grooved sheaves. This type of sheave is made in a special flask, with provision for ramming the sand very compactly in the grooves, the latter coming out of the sand so true and clean that they are merely smoothed a little with emery for a finish. The best and most economical sheaves made today are molded by special machinery, and come from the foundry almost true and smooth enough to be used without machining, though a light cut is usually taken.

The tension carriage is a most important element of the drive and it should adjust itself automatically to the proper inclination. It is obvious that as the rope is wound spirally on the sheaves it must be led back from the last groove of one of them to the first, otherwise it would run off the sheaves entirely. The tension carriage sheave is set at the proper inclination to accomplish this. It must take care of all the minor inequalities and variations in the sheave and rope, as well as provide the proper back-pull for the required driving force, hence the carriage should be on good-sized rollers so as to be sensitive and immediate in its action. Sufficient travel should be provided for it to take up about one-fortieth of the length of the rope. This operation is often reversed, and I have frequently known tension carriages to be drawn up as far as possible by the shrinkage of the rope after a heavy rain or period of wet weather. The weight used should be only just enough to give the requisite driving force without slipping; any more than this only puts an unnecessary strain on the rope and shortens its life. The location of the tension carriage in the drive is as often determined by convenience as anything else. It may be horizontal, vertical or inclined. Two things must be kept in mind, however—it must be on one of the slack ropes, and if the particular slack rope cannot conveniently be taken from the driver directly around the tension sheave, but for convenience of location must be led around the driven, or some other sheave, it must be taken around a loose groove, so that it may lead directly to the tension carriage without interference.

The final element of transmission is the rope. In the English system, cotton ropes are generally used. This is probably from force of habit, as these drives were first introduced in textile mills, where cotton was a familiar article. It is, however, well adapted for drives of this kind, because it has comparatively little elasticity, and does not stretch, hence it is easier to keep the ropes of uniform length than with hemp or manilla. This rope is made somewhat peculiarly; it has four strands twisted together in the usual way, but each strand consists almost entirely of a bundle of yarn laid parallel with practically no twist. Each of these four bundles of yarn is wound spirally with some quite small bundles, which serve as binders and as a protection. This is what is known as the Lambeth brand of rope. It is very pliable, and the friction of the soft cotton yarns on each other is less destructive than with manilla; but the latter is much stronger than cotton, and is almost universally used in the American system.

Manilla rope for the transmission of power should be made especially for that purpose. The twist should be looser than with ordinary ropes; only the longest and best fibers should be used, and selected so as to be of uniform size for the same rope. These are laid up as the rope is made, in tallow, which acts as an internal lubricant and also protects the fiber from moisture. Graphite is sometimes used also in addition to the tallow, and assists in preventing internal chafing, but there is great difficulty in making the splice hold in such a rope. The best transmission rope, as shown by a series of tests, is made as above described, laid up in tallow merely, and distinguished by a red yarn running through it. Up to one inch and a quarter, three strands are used, and above that, four. The four strand rope is the better shape, as being more nearly round, but in the smaller sizes the strands are so small that they do not make so good a splice. While not absolutely necessary, external dressings applied at intervals to the ropes are desirable, especially for out-door drives, and where the rope is exposed to a hot, dry atmosphere. These dressings are made of varying proportions of such ingredients as tallow, graphite, pine tar, linseed oil, cottonseed oil, molasses, rosin, etc. One very conveniently applied dressing is made in the form of sticks about 18 inches long and 3 inches in diameter, which are held against the rope while it is running.

Ropes of rawhide gave great promise a few years ago and a number were put in use; most of these have been replaced with manilla. Rawhide rope has great flexibility and having comparatively few strands is better able to stand internal and external friction, as there are no small yarns to chafe and break. Its most frequent

* From a paper read before the Western Society of Engineers, May 5, 1897, by Mr. Staunton B. Peck, M. Am. Soc. M. E., Chief Engineer of the Link-Belt Machinery Co., Chicago.

use was for dynamo drives and where small sheaves were necessary. The great elasticity causes a good deal of whipping and slapping, and it is very difficult to make a splice hold; furthermore, the first cost is several times that of manilla, and as it has not shown a proportionately greater durability to justify this, it is probable rawhide will never be used to any great extent.

The splice is the weakest part of the drive. Correctly made, however, and in a properly designed drive, it should never give any trouble. Much of the trouble caused by the failure of splices is due to the prevailing notion that any kind of a splice will answer. The ordinary sailor's splice, or the short splice, is quite inadequate for trans missions. The splices suitable for the latter are variously known as the English splice, or the long splice, and are from 80 to 150 diameters of the rope in length. Various mechanical splices have been tried, but most of them have had a very limited use. One objection to them is that they give way without warning, whereas the ordinary splice usually attracts attention by beginning to unstrand in ample time to prevent any damage.

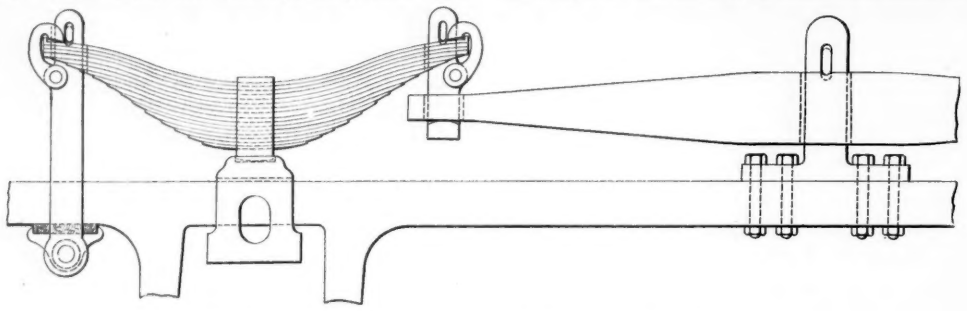


Fig. 1.—Safety Spring Hanger—Chicago, Indianapolis & Louisville Railway.

In vertical drives, and in main drives from the fly wheels of engines, it is well known that there is excessive journal friction from the tightness at which belts must be kept in the former case, and from their great weight in the latter. Much of this is saved by the use of ropes, beside the advantage of a much quieter and smoother running drive. It is not at all uncommon to find 15 or 20 per cent. of the power absorbed by journal friction and the stiffness of heavy main belts. A properly designed rope drive of the American system does not absorb more than four or five per cent. As it is not good practice to require a single tension carriage to take care of more than about eight or 10 wraps of rope, these main drives are usually made up of two or more drives side by side exactly alike, each having its own rope and tension carriage. Another plan sometimes employed is to wind the ropes in pairs, treating a pair of ropes precisely as though it were a single rope. Although there are some successful drives running in this way, this plan is not to be commended, as the two ropes on the tension carriage do not permit it to properly control either. An advantage of dividing main drives as noted above, is that a portion of them may be run independently, or repaired while the balance of the drive is running.

In crossed, quarter-twist and mulestand drives, the flexibility of rope and the ease with which it may be led around the corners, make a very appreciable saving of the large percentage of power that is wasted in overcoming the stiffness of belts under similar conditions. It is entirely practicable to reverse motion by actually crossing each strand of rope; that is, by leading successively from the under side of one sheave to the upper side of the other, and vice versa; but the sheaves for this kind of a drive must have sufficient distance left between the grooves so that the ropes can pass each other between the sheaves without coming in contact and sawing.

Freedom from slipping makes rope particularly suited for dynamo drives for electric lighting, assuring a steadier current.

The speeds at which ropes are run range from 1,000 to 5,000 ft. per minute. I have known of drives running successfully as high as 8,000 ft. Above 5,000 ft. a calculation using the ordinary formula, will show that centrifugal force tending to throw the rope out of the grooves, becomes an important factor. Experience would seem to show, however, that practically it does not act as rapidly to diminish the driving force as it is theoretically supposed to. Its action can be counteracted by additional weight on the tension carriage, so that I have no doubt but what successful transmissions could be employed at a rope speed as high as 10,000 ft. per minute, or more, although the wear of the rope would be rapid. The best speeds are from 2,500 to 4,500 ft. per minute.

The use of winder sheaves is occasionally resorted to to give additional frictional adhesion at both driving and driven ends of a transmission. That is, the rope in passing from driver to driven is wrapped one or more times as may be necessary around another sheave near the driver before being led around the driven, and wrapped around a similar sheave near the driven, before returning again to the driver. The advantage derived is not as great as might appear at first sight, as the tax upon the rope is greater from the frequent bending, and from the increased strain put upon the fewer number of ropes that transmit the power. This device may be used to advantage, however, in very long transmissions, as it reduces the amount of rope and the number of grooves in the carrying idlers; and also in drives where there is a great disparity in size between the driving and driven sheaves. In drives of this kind care must be taken not to place the rewinder too near the sheave, as there may not be sufficient elasticity in the strands of rope to equalize the differential action set up by the unavoidable inequalities in the size of the rope and the grooves of the sheaves, and an excessive strain is produced on the shafts.

There are three questions that are constantly asked about rope transmissions; what powers will the various sizes of rope transmit at given speeds; how long will the rope last, and what is the cost relative to other modes of transmission? Unfortunately, a clean-cut, decisive answer cannot be given to any of them. There have been tables published giving the horse-powers of different sizes of rope at various speens, but none by any one who has had the experience that would make such a table reliable. Large sheaves and a few wraps of comparatively large ropes should be used in preference to small ropes and many wraps. Excessive speeds, reverse bends and frequent turns should be avoided as far as possible. In no small number of cases, however, the exigencies of the situation necessitate some one or more conditions that are unfavorable, and it is obvious that the work demanded of the rope should vary, as experience has shown the conditions to be more or less unfavorable. As an average illustration, however, of its transmitting power, it may be said that under ordinary conditions and at a speed of 2,500 ft per minute, 1-in. rope will satisfactorily transmit 12 H. P., 1¼-in. rope, 26 H. P., and 2-in. rope 48 H. P. It must always be borne in mind that the durability of the rope must be kept sight of as well as the actual transmitting power. This varies greatly. Drives put in on the English system, using cotton ropes, are numerous where the ropes have lasted 10 to 20 years. These drives, however, all have ropes 2 in. or more in size, and very large sheaves proportionately. It may be said that the average life of ropes of medium size is upward of five years. A great many that were put in more than five years ago are still giving good service to-day, so that as a matter of fact the system has hardly been in use long enough to determine what would be a fair length of service to expect. The small ropes under unfavorable conditions often have to be renewed annually. One concern running a ¾-in. rope at high speed on a 9-in sheave puts on a new rope every three weeks, yet the transmission is the most successful means found to accomplish the purpose.

In the matter of comparative cost of rope and other transmissions, it can only be said that the grooved sheaves are considerably more expensive than plain pulleys, and there is the additional cost of the tension carriage, while on the other hand rope is very much cheaper than belting. From this it can be inferred that short drives of belts are the cheaper, while long drives of rope have the advantage in first cost, and increasingly so as the distance between centers increases. Again, with heavy main drives, from fly-wheels to jack shaft the large leather belts are so expensive that even with comparatively short centers the rope transmission is the cheaper.

Chicago, Indianapolis & Louisville Shops at La Fayette.

The Chicago, Indianapolis & Louisville Ry., formerly the Louisville, New Albany & Chicago Ry, has, since October, 1895, been using the new locomotive and car shops at La Fayette, Ind., before that the principal shops were at New Albany, Ind. The railroad company owns about 48 acres of land at La Fayette which gives ample space for present yard and shop facilities, and for future extensions. As the shops were all built at one time, according to a carefully prepared plan, the appearance of the buildings, which are of red brick with stone trimmings, and the arrangement, is better than is usual in railroad shops.

There are two main buildings, one either side of a 70-ft. transfer table. The first of these contains the machine shop, 210 ft. long, and the boiler shop, 90 ft. long, the building being 95 ft. wide. The blacksmith shop, occupies an extension adjoining the boiler shop, which is 96 ft. × 100 ft. In a similar extension are the engine and dynamo room, 63 ft. 5 in. × 49 ft. 6 in. and the boiler-room, which is 38 ft. ×31 ft. The second main building is used for a car shop and measures 95 ft. × 300 ft. There are also several smaller buildings, one 95 ft. × 150 ft. being the paint shop, and one 30 ft. × 60 ft. 10 in. the oil-house, while the offices and storerooms occupy a building 50 ft. wide by 96 ft. 10 in. long. There is also a roundhouse, built around a 70-ft. turntable, which contains 20 stalls, but by completing the circle it can be enlarged 35 stalls. Near the roundhouse are the cinder pits and the coal wharf.

All the shop buildings are well lighted by large windows and skylights and are equipped throughout for using compressed air. The greater part of the tools were bought new from the Niles Tool Works when the shops were built. The engine-room contains, in addition to a Hamilton-Corliss engine, an Ingersoll-Sergeant air compressor and a dynamo, the dynamo furnishing current for lighting the shops and operating the flue tumbler and transfer table, which are provided with electric motors.

The transfer table is built up of 14-in. steel I-beams, and in a small house mounted on the table are two G. E. 800 street car motors and a controller. The motors are connected through clutches to a shaft which drives the table by a system of gears. The voltage used is 200 volts. Running from the transfer table are 10 tracks to the car shop, eight pit tracks to the machine shop, one track to the drop pit and two tracks to the boiler shop, in addition to two tracks connecting the table and yard.

The shops are provided with a separate water-works, and there is also a connection with the city mains, so that the city water supply is available in case of fire.

Particular attention is given at these shops to the economical handling of new and scrap material, and the storeroom and scrap bins are conveniently placed with reference to the loading and unloading tracks. In the storeroom everything is carefully arranged and strict account is kept of all material received and shipped. One of the things which impresses a visitor is the neat appearance and cleanliness of the shops and grounds which follows directly from paying close attention to the disposition of supplies and scrap.

The engravings show some locomotive details used by this road which differ from general practice.

Fig. 1 shows the safety attachment as applied to locomotive driving spring hangers. This consists of a cast steel hook which is joined to the hanger below the spring by a pin connection and overhangs the end of the spring. The hook is provided to hold the spring in place should the hanger break, which often occurs at the point where the hanger passes through the spring.

Fig. 2 is the eccentric strap and blade designed to provide a connection between these parts that would not work loose. The piece *A* is welded to the blade, and comes against a shoulder cast on the strap. The blade is fitted in the recess in the eccentric strap and is held by the bolts *BB;* slots are formed in the blade through which these bolts pass and which permit of an adjustment of the blade, while the stud bolts *CC* are depended upon to complete the connection, and to transmit the stresses from the eccentric strap to the eccentric rod. It will also be noted that provision is made for using two oil cups on each eccentric. This method of joining the eccentric straps and blade has given very satisfactory results in service.

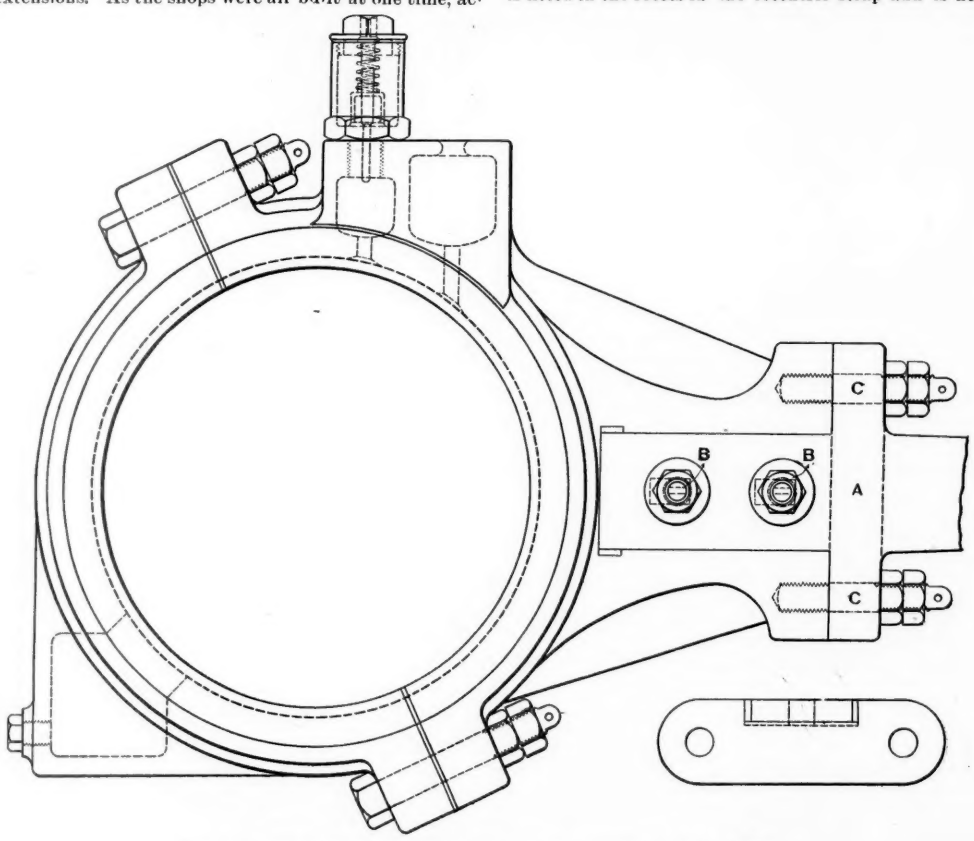


Fig. 2.—Eccentric Strap and Blade—Chicago, Indianapolis & Louisville.

Fig. 3 shows the standard eccentric, which avoids us-

ing eccentric bolts and nuts to hold the two halves together, and the new method of fastening has been found to prevent the eccentric from working loose on the axle. The projections *AA* on the lower half are fitted to the corresponding recesses in the upper half of the eccentric, and the two eye studs *BB* are screwed into the lower half. The flat portions of the studs enter slots cored in the upper half of the eccentric, and when these are in place the two halves are clamped together, and the holes *CC* are drilled and reamed to take a turned steel pin, which pin is secured by a cotter at its end. For holding the eccentric on the shaft to prevent turning, there are used, in addition to the key, three set screws; one of which is placed directly above the key while the remaining two engage the shaft. Brass plugs *DDD* prevent the set screws from working loose.

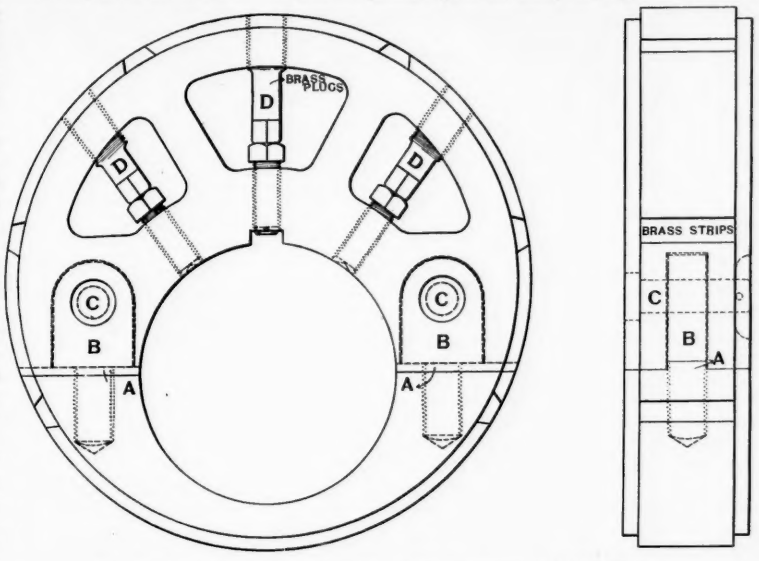


Fig. 3 — Locomotive Eccentric—Chicago, Indianapolis & Louisville.

Fig. 4 is a section of a new locomotive valve as applied to engines having the steam ports and valve seat arranged in the ordinary manner; namely, a steam port to the cylinder on either side of the exhaust port. As the new valve has double exhaust ports it is necessary in the application of the valve to old engines to use a false valve seat, *A*, which makes necessary the 2-in. filling piece *B* under the steam chest and the additional steam joint at *C*. When using the valve with new cylinders the ports can be cored in the casting and the false valve seat will not be required. It will be seen that the portion of the valve controlling the steam admission is of the Allen type, but the new feature has only to do with the control of the exhaust.

The valve is shown in the middle position and supposing it to be moved to the right, the steam in the cylinder is allowed to expand into the exhaust cavity of the valve and in the common type of locomotive valve it would at this point be free to escape. With the new valve, however, the double exhaust ports are not uncovered until the valve has moved ⅛ in. from the central position, at which time twice the usual port opening is uncovered, which results, it is claimed, in 40 per cent. greater expansion of the steam in the cylinder due to delaying the point of exhaust opening and a freer exhaust is provided on account of the double ports when exhaust finally takes place.

These valves have been in use on the Chicago, Indianapolis & Louisville on a 10-wheel freight engine since October, 1895, and since that time they have been applied to three consolidation locomotives. All of these engines have cylinders 20 in. × 24 in., and have shown an improved performance with the new valves. The special devices illustrated by Figs. 1 to 4 inclusive were designed by Mr. H. Watkey, Master Mechanic of the La Fayette shops.

Oil-Coated Ballast as a Preventive of Dust.

The West Jersey & Seashore Division of the Pennsylvania Railroad system has inaugurated a new method of treating the surface of its roadbed, the object being to prevent dust. The invention, which is patented by the Assistant Engineer of the company, Mr. James H. Nichol, consists of the application of a heavy oil of low cost, the product of petroleum distillation. This oil being applied to the surface of the track and roadbed, including the sides of slopes in cuts, fastens the loose particles of the surface together, and prevents them being lifted.

The principal reason for the discarding of gravel ballast on many railroads has been the discomfort to passengers arising from dust. Stone ballast, when first applied, and after being washed by rains, is clean and free fron dust until it becomes filled with material, largely cinders, and in this condition it requires to be forked out and cleaned at large expense; the tamping of the tie results in the stone being crushed; and if of a limestone character a condition resembling a cement trough is formed under each cross-tie, which catches and retains rain water, causing the tie to decay. Cinder ballast after being newly applied requires several rainstorms to wash it free from dust, and then it is reasonably clean until the work of surfacing of track or renewing the cross-ties stirs up the cinder from below the surface and exposes a new layer of dust. After a few years' use cinder becomes pulverized by repeated tampings and is then a more objectionable dust than from gravel, being dark in color. Experience shows that the oil produces equally good results with under as with gravel or sand.

The method inaugurated by the West Jersey & Seashore Railroad has several features of importance, viz., the reduction of wear on machinery, because of the absence of dust, fewer hot boxes, the preservation of cross-ties themselves—being covered with oil, rain water is prevented from penetrating the ties, and in a measure from penetrating below the surface of ballast. The use of oil was commenced in April last; at the present time there is something over 100 miles of single track treated on the West Jersey. The Philadelphia, Wilmington & Baltimore is building a sprinkling car in preparation for extended use, and beginnings have been made in the use of oil by the Philadelphia Division and Middle Division of the Pennsylvania Railroad; also by the Amboy Division of the same company.

On the West Jersey & Seashore three months exposure of track treated once shows a penetration in gravel ballast of 3 to 4 in., being greatest where the gravel has least clay or loam in its composition. Walking on this ballast colors the sole of the shoe with oil; the ballast itself is not picked up on the shoe, but is pressed into the ballast beneath, a slight impression being made by the foot. When trains pass at speed no dust whatever is lifted; the track is absolutely dustless. The oil has penetrated the cross ties from ⅛ to ¼ in., according to the closeness of the grain of the wood; all of the ties are of oak.

At a number of places track surfacing has been done after the application of the oil without creating dust, there having been a sufficient amount of ballast impregnated to prevent dust; this summer's experience has demonstrated that one application will last at least one season and indefinitely thereafter, or until ballast is broken up by renewals of crossties; it is confidently expected that two or not more than three applications will suffice for years, the ballast will be impregnated to and below the bottom of the cross-ties and removals of the latter will not cause dust to be turned up

The oil used is non-combustible and has but little odor, not of an offensive kind when first applied; on exposure for a few days the odor is lost. The oil in the ballast is long-lived; it does not saponify, and in three months gives no evidence of emulsifying.

For distributing the oil an ordinary flat car is fitted with one fixed pipe extending the length of the cross-ties and two swing pipes—one on each side—which when extended will reach two or more feet up the sides of slopes in cuts. Each pipe is controlled by a gate valve worked by a lever; a supply pipe extends the length of the car and a rubber hose connects with the 4 in. outlet in the ordinary tank car. A locomotive moves both cars and furnishes steam or compressed air to aid in ejecting the oil when thickened by cold weather. The flat car has box for tools, extra parts, etc , and is partly covered with an awning to protect the men. The sprinkling pipes are slitted for the oil to escape. The sprinkling car is furnished with shields which cover and protect the rails from any oil which might drop or be splashed onto them. One end of the supply pipe on the sprinking car is fitted with connection for three or more lengths of hose, each terminating in a valve and spreader, for use by hand in covering the sides of slopes in cuts. The equipment of a flat car costs about $200.

The quantity of oil used is 2,000 gals. per mile; ordinary commercial tank cars holding 6,000 gals. each are distributed at sidings about three miles apart and are picked up as needed, the empty car being left. The speed of the train at work is about four miles an hour. Further particulars can be obtained from the patentee at Camden, N. J.

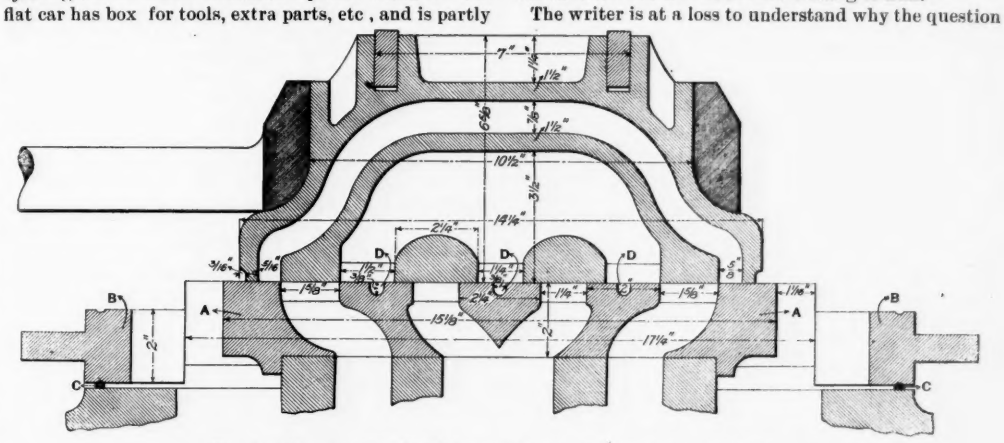


Fig. 4.—New Locomotive Valve—Chicago, Indianapolis & Louisville.

Suburban Competition.

BY CHARLES J. BATES, M. AM. SOC. C. E.

Mr. Westinghouse says (according to the *Railroad Gazette*) that a central station, with its necessary connections, for 1,200 H.P., will cost eight times as much as a locomotive of the same power, and he is no doubt right; but let us see what application this statement has to suburban service. We will say that such an engine can handle 40 cars in one train: but in suburban travel we shall be obliged to use our 40 cars in trains of probably four cars each, requiring 10 locomotives. The electric method of application enables us to use the full 1 200 H.P. of our station, divided among the trains, and while the locomotives do not exert their full power, 10 engines at $9,000 will cost a quarter more than, instead of only a fraction as much as, the central station. Now, of course no railroad man is going to use 1,200 H.P. locomotives for four-car trains, but 10 engines, of such size as will meet the usual requirements, will cost a large part of the cost of a central station, and the expense of engine crews, repairs, additional fuel burned, etc., will be greatly in excess of the interest on the additional cost of the central station.

The fuel question is a very difficult one. The practical impossibility of determining, with any exactness, just what duty a locomotive is performing during a definite and considerable length of time, as compared to a stationary engine, whose action is comparatively uniform, makes it almost hopeless to ascertain the relative fuel economy of the two methods, without long experience. To haul a ton of freight by canal is no doubt cheaper than by railroad, but the facilities of the railroads are not to be abandoned for the apparent economy of the canal. We have a few tests of locomotives determining the consumption per indicated horse power; but these have been made under special conditions. The consumption and waste of fuel is great when starting and during acceleration, and the horse-power and consumption vary greatly with the speed. No intelligently made effort to compare fuel consumption of locomotives and central stations, has been made public.

Mr. Barnes said truly that "no railroad company should undertake the substitution of electric motor for steam locomotives without the most searching inquiry." Will the system under consideration meet all the various exigencies of railroad operation? We may say there are three main points to be considered: First, the handling of trains under different conditions, shifting about the yard and other cases innumerable of which the general superintendent is most competent to judge; second, are the mechanical details of the system so designed as to do their work in the best way? questions of which the mechanical superintendent is the best judge; third, are the circuits so perfected as to insure freedom from leakage, certainty of contact, etc. points that, among those in the company's service, the superintendent of telegraphs is most competent to investigate, though on account of the relatively limited character of his duties, it might be better to employ an experienced electric engineer. But do not assume that because electric traction is under consideration, that an electric engineer or company manufacturing electric apparatus is the best judge of what will best meet all the needs of a trunk line or its suburban demands Colonel Hain complained that, with one exception, all the electric men who had shown him their systems had worked out their details industriously, but had altogether failed to consider operating conditions, without which there was no use of their coming to him.

The writer is at a loss to understand why the question of leakage is made light of. Is it because of the incompetence of the engineers to appreciate the seriousness of the question, or are the manufacturers of the apparatus, aware of the imperfections of their systems, anxious to distract attention from a weakness they are unable to rectify? Not that the defect cannot be corrected, but that men competent to solve the difficulty are not in the service of the builders of the systems laid down and own patents that conflict with the commercial interests of the manufacturers. Colonel Heft, in the *Street Railway Journal*, speaks of leakage as too small to be considered. I have heard from an inspector of one of the most extensive trolley lines in the country, that leakage has reached 75 per cent. and completely blocked

the line. If that is a possibility under any conditions, what must its continued action be under conditions not ordinarily observable? Leakages from trolley lines or third rails are incurable. The *Railroad Gazette* has specified the fatal objections to such systems where yards are concerned. Our knowledge of friction shows that no continued high speed is possible with a third rail and sliding contact shoe, for such a shoe must inevitably heat, thus destroying its conducting power if nothing worse occurs.

A system with separated contact points, always dead except under the cars, and a properly insulated underground conductor, is free from the objections, for it can be applied with ease and safety in any yard, however complicated the tracks may be; there is no difficulty at crossings either of highways or other railroads; no risk of short circuiting by anything, either human or metallic, falling on the track. With a system of this kind the contact points may, any one of them, be "cut out" for examination or repairs, without interfering with the working of the system; the insulation may be thorough, leaving no live surfaces to cause leakage or short circuit.

Most of the magnetic systems offered possess the desired qualities, but their complicated mechanism and the unreliability of action inherent in all magnets, and the necessity of constant adjustment, must prove serious drawbacks to them. In all machinery a simple direct mechanical movement is the only really practical way of satisfactorily accomplishing the desired result; and there should be no difficulty in devising a simple movement for closing and reopening the circuit as the car passes. In fact there seems little reason to doubt that proper enquiry would bring such a system to light.

Counterbalance Tests of the Strong Engine at Purdue University.

The Balanced Locomotive & Engineering Co., New York, has recently had a series of tests made on its engine No. 1 at the Purdue University testing plant, La Fayette, Ind., with special reference to the effect of the drivers on the track. The manner of mounting the engine and conducting the tests was the same as used by Prof. W. F. M. Goss in making former tests of Schenectady No. 1 to determine the effect of the counterbalance. This method involves introducing small copper wires between the driving and supporting wheels upon which the variations in pressure are recorded while the engine is running at different speeds.

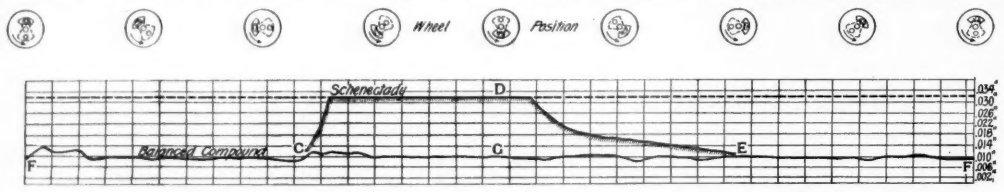
The earlier tests made at the Purdue testing plant were described by Professor Goss in a paper before the American Society of Mechanical Engineers, December 1894, entitled "An Experimental Study of the Effect of the Counterbalance in Locomotive Driving Wheels upon the Pressure Between the Wheel and Rail," and also in the *Railroad Gazette*, December 21, of the same year. It is, therefore, unnecessary now to repeat what was given in that paper, although the report by Professor Goss, covering the tests of the balanced engine, contains a complete description of the apparatus used, the manner of conducting the tests and a discussion of of the common practice in balancing locomotive driving wheels.

The balanced engine tested was built several years ago for the Strong Locomotive Co. and changed in 1895 to conform to the designs of Mr. Geo. S. Strong for a perfectly balanced locomotive. The changes were principally in the axles, valve gear and cylinders and were described in the *Railroad Gazette*, Feb. 22 and June 14, 1895.

There are two low-pressure cylinders outside and two high-pressure cylinders inside the frame. The low-pressure pistons are connected to the drivers through piston rods, crossheads, connecting rods and crank pins in the usual manner, while the high-pressure connecting rods work on cranks formed in the axle. The inside crank is diametrically opposite the outside crank on the same side, while the cranks of the engine on one side are at right angles with the corresponding cranks on the other side. All the revolving parts are balanced by revolving weights and all reciprocating parts by reciprocating weights. In each of the rear drivers the counter weight is sufficient only for the revolving parts connected to the crank pin, while in each of the main drivers the counter weight balances only the revolving weights attached to the outside crank pins. The revolving parts attached to the inside cranks are balanced by revolving weights formed by a backward extension of the cranks. The reciprocating weights acting on the various cranks are equal, and, therefore, as the cranks on the same side of the engine are set at 180 deg., the high-pressure reciprocating weights balance the low-pressure reciprocating weights on the same side.

A large number of tests were made with this engine which showed that the total variation in the thickness of the soft copper wires did not exceed .006 in., and in the accompanying diagram a comparison is made graphically of wires taken from the balanced locomotive and from Schenectady No. 1 in a similar manner. The thickness of the wire is represented in each case by the distance from the base line to the curve. The important difference in condition is to be found in the fact that the wheel of Schenectady No. 1 carried 400 lbs. excess balance, while that of the balanced engine had no excess balance. The diagram shows that while the wire from the balanced engine is nearly of the same thickness throughout, that from Schenectady No. 1 increases in thickness as the counterweight in the wheel approaches the upper quarter until its full diameter is reached, showing that the wheel must have risen clear of its support during a portion of its revolution. The slight variations in thickness of the wires from the balanced locomotive are accounted for by changes in the position of the engine on the supporting wheels and other accidental causes which would result in slight differences of pressure. These variations do not seriously affect the results and cannot be attributed to the balance. It was also observed that while the balanced engine was running there was very little jerk on forward and backward motion, and also so little nosing action that the side swing of the first bolster was not over ⅛ in. under any speed at which the tests were run, which ranged between 30 and 60 miles an hour.

We quote the following conclusion from Professor Goss' report: "Whatever the speed, the wheel pressure of the balanced locomotive will not vary except as the wheels may be acted upon by accidental forces, as, for example, impact due to inequalities in the track or changes in the position of the center of gravity of the heavier portions of the machine relative to wheels, through the engine rocking or tipping on its springs. The wheels at all speeds turn smoothly, while the machine as a whole remains almost motionless. Oscillations of every sort which appear in the balanced locomotive are of less than one-half the amplitude of those which attend the action of a locomotive of the ordinary type. It is evident, therefore, that the means adopted to secure perfectly balanced wheels have also served to greatly increase the steadiness of the locomotive as a whole."



Locomotive Schenectady, Diameter of Driver 62.5 in., Revolutions per min. 337, Excess Balance 400 lbs.. Curve C D E. Balanced Compound Locomotive, Diameter of Driver, 67.4 in., Revolutions per min. 323, Excess Balance None, Curve F G F.

Comparison of Wires taken from Locomotives Schenectady No. 1 and Balanced Compound No. 1. Dotted Line Shows the Original Diameter of Wires.

Electricity as a Motive Power on Elevated Railroads.

BY S. H. SHORT.

The elevated railroads of New York, Brooklyn and Chicago were built to satisfy a crying demand for rapid transit from the business centers to the suburban districts of these great cities. So long as they had for their only competitor the slow-moving horse car they were considered a great convenience, notwithstanding that one was obliged to walk from one to three blocks and climb a difficult flight of stairs to reach these rapidly moving trains.

Since the "trolley car" has come into general use, people have been educated to a still more rapid rate of travel, and where the trolley car parallels the elevated railroad, as in Brooklyn and Chicago, the frequent, speedy and accessible surface car is by far the more popular. In New York, however, the elevated railroads still enjoy a very large traffic, because the electric cars do not parallel their lines, nor are the facilities for transportation yet sufficient for the enormous masses to be moved back and forth in that city. However, the surface lines are soon to be equipped electrically and their carrying capacity thereby enormously increased to the detriment of the elevated railroad travel. In order to retain their traffic, it will be necessary for the elevated railroads to move their trains more frequently and at a much greater rate of speed to compensate the traveling public for being obliged to walk some distance and climb those disagreeable stairs. It would add greatly to the travel on these roads were some plan devised for mechanically lifting passengers to the elevated stations.

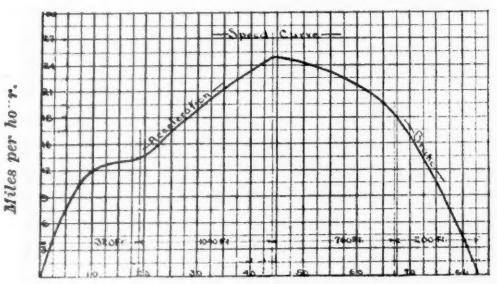


Fig. 2.—Present Manhattan Elevated Train—Ninth Avenue, Twenty-third to Fourteenth Street—2,320 ft.

The elevated roads are all built on the same general plan, the structure being provided with double track throughout the entire length, with stations about ½ mile apart. The grades are slight and the curves of not less than 90 ft. radius. The structure is made to safely carry the standard elevated train, *i. e.*, five passenger coaches, each 46 ft. in length, weighing, when loaded with 75 passengers, 20 tons, drawn by a locomotive weighing 23½ tons, making a total of 123½ tons for the complete train.

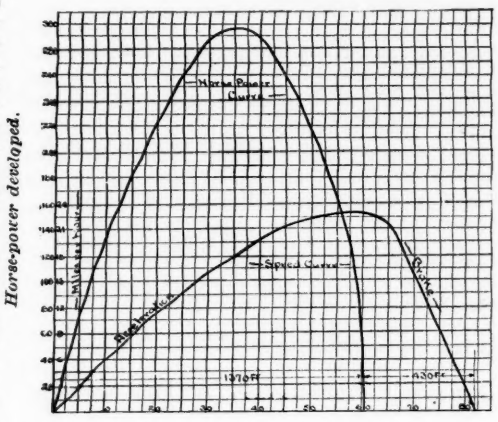


Fig. 1.—Present Manhattan Elevated Train—Ninth Avenue, Sixty-sixth to Fifty-ninth street—1,800 ft.

The locomotives are constructed so that 65 per cent. of their weight, or 15¼ tons, are upon their drivers, giving an adhesion and, therefore, a maximum horizontal effort for accelerating the train of 7,650 lbs. This effort is used for accelerating the train for 50 or 60 seconds and a speed of 20 to 25 miles per hour is attained while a maximum of 300 H. P. is developed by the locomotive. The brakes are then applied with a negative acceleration and the train is brought to a standstill at the next station where it remains on an average of 13 seconds.

In the accompanying diagrams (Figs. 1 and 2) I have illustrated graphically the performance of one of these trains, between stations, also the consumption of power as calculated from the weight and speed of the train. It will be seen therefrom that it is not possible with steam to make a better schedule time than is at present in force, *i. e*, 13½ miles per hour, unless the weight of the locomotive be increased or the trains be lightened. The heavier locomotives would endanger the safety of the entire structure. The lighter loads would necessitate more frequent trains, consequently a much larger force of skilled employees to run the extra locomotives.

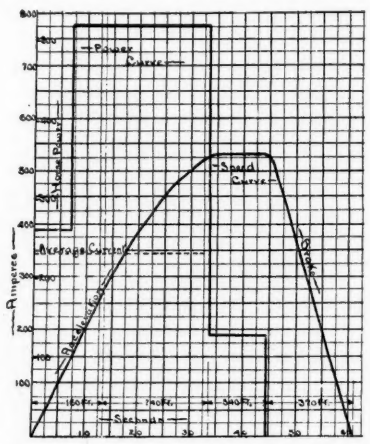


Fig. 4.—74-Ton Train—2, No 25, L, 200 H. P. Motors —Schedule 16½ Miles an Hour—1,800 ft. between Stations.

The cost of fuel for operating a steam locomotive amounts to about 20 per cent. of the total operating expenses of these roads, the fuel consumption being about 7 to 8 lbs. of coal per horse-power per hour.

With good compound condensing engines driving electric generators at a station, the coal consumption is reduced to about one-third of that amount.

Were steam locomotives discarded it would be possible to replace the high priced skilled labor necessary for their operation by ordinary trustworthy men who are not skilled mechanics; whose rate of wages is about one-half that of a locomotive engineer, and only one man would be necessary to operate the electrical propelling mechanism. We believe the repair account will be materially lessened both in the units of motive power and in the permanent way were the trains equipped with motors. The care of a steam locomotive is very onerous, the average run being only about one hundred miles, when it must be thoroughly overhauled and inspected by skilled mechanics before being used again. Contrast with this the all-day service of most electric motors two or three hundred miles a day for days and

weeks, without inspection, cleaning or care of any kind.

The standard electrical equipment for an elevated train consists of the present elevated car, provided with two swiveled trucks of special construction arranged to receive electric motors of a type adapted especially for this service. The wheels of the trucks are 33 in. in diameter, and the wheel base does not exceed 6 ft. for the largest motors, and is reduced to 5 ft. 6 in. where motors of the smaller size are used. The weight of the

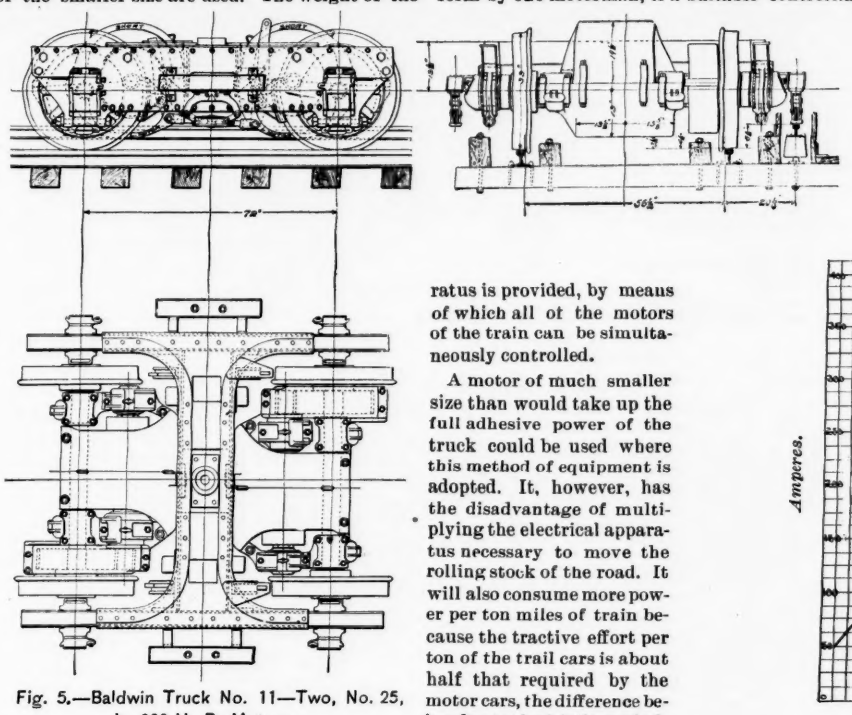


Fig. 5.—Baldwin Truck No. 11—Two, No. 25, L, 200 H. P. Motors.

motor car loaded to its full capacity with passengers is 32 tons, including trucks, motors and the electrical equipment.

In most cases it is advisable to use only two motors upon a motor car, and both should be placed on one truck for convenience in repairing. There is, therefore, 19⅓ tons upon the drivers, or 61 per cent. of the total weight of the motor car, which corresponds favorably with the percentage of the total weight of passenger locomotives upon their drivers. This gives an adhesion and, therefore, a maximum practical horizontal effort for the motor car of 9,750 lbs., or a total possible horsepower of 400 in accordance with standard motor rating.

This pair of motors is, therefore, capable of accelerating a train of three standard elevated cars at the rate of 1.85 ft. per second, and of making a schedule of 16⅔ miles per hour including stops, as illustrated graphically by the accompanying diagram (Fig. 4).

If the other truck of the motor car is also equipped with motors, a train of double that size will operate in exactly the same manner, and one more car may even be added, because the tractive effort required per ton decreases materially, as the number of cars in the train increases, there being but one motor car on the train. It is not advisable to use more than two motors, owing to the complications which arise in the controlling devices.

The requirements of the service to be rendered on the different elevated railroads necessitates very careful consideration being given to the size of the motor to be used upon the different roads. There seems to be no question about the advisability of using as large a motor as possible upon a road like the Sixth avenue in New York, where the travel is constant throughout the day, and trains of from four to five cars can follow each other at short intervals all day. But in Brooklyn and Chicago, where the traffic is heavy during short periods of time, and light during a larger part of the day, it seems desirable that trains of few cars, or even single motor cars, shall be run at frequent intervals without a printed time table, thereby practically securing a high speed street car service on the elevated structure.

Another reason for frequent and light trains is that these roads have branches, which by this method would be served to better advantage.

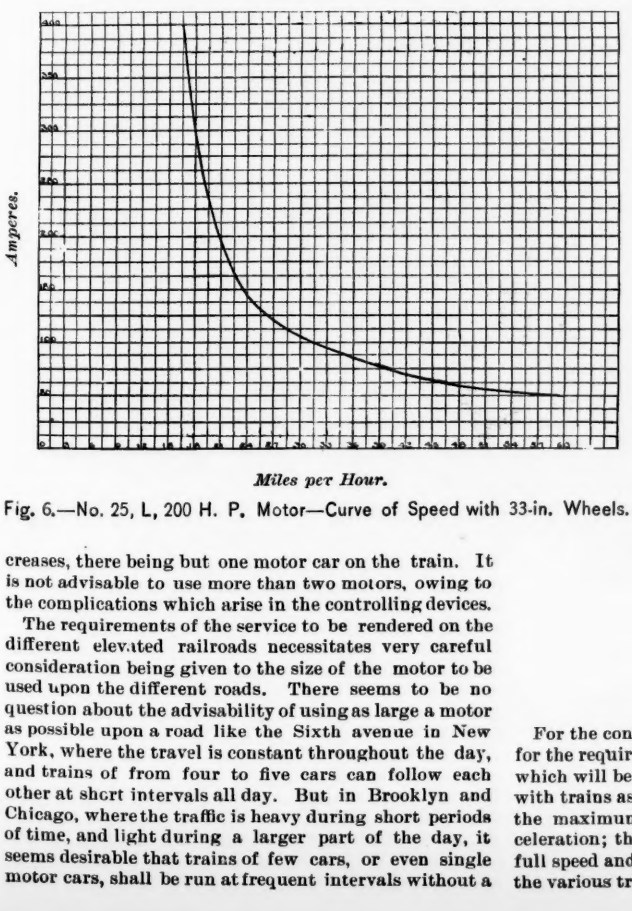
It is possible also that these single motor cars or short trains may be coupled into longer trains during the rush periods of the day and be operated from the front platform by one motorman, if a suitable controlling apparatus is provided, by means of which all of the motors of the train can be simultaneously controlled.

A motor of much smaller size than would take up the full adhesive power of the truck could be used where this method of equipment is adopted. It, however, has the disadvantage of multiplying the electrical apparatus necessary to move the rolling stock of the road. It will also consume more power per ton miles of train because the tractive effort per ton of the trail cars is about half that required by the motor cars, the difference being due to the friction, windage, etc., of the motor cars.

The accompanying drawing (Fig. 5) illustrates the Baldwin standard elevated truck equipped with two standard 200-H. P. "L" motors which we have recently designed for this work. These will operate a standard elevated train of three cars, fully loaded, at a schedule speed of 16⅔ miles per hour. We also give train data sheet (Marked Train No. 1) for this equipment, and speed and horizontal effort curves (Figs. 6 and 7) for the motors.

The next drawing (Fig. 8) is a standard Jackson & Sharp truck, equipped with two 125 H. P. "L" motors, of the same design, capable of moving a standard elevated train of two cars, fully loaded, at a schedule speed of 16 miles per hour. Also a train data sheet (Train No. 2) and curves (Figs. 9, 10 and 11) for this equipment.

The next drawing (Fig. 12) shows two 60-H. P. motors of the "L" type, mounted upon a standard McGuire truck, capable of operating a single standard elevated coach at a schedule speed of 15⅓ miles per hour, with its corresponding train data sheet (Train No. 3) and curves (Figs. 13, 14 and 15).



Miles per Hour.

Fig. 6.—No. 25, L, 200 H. P. Motor—Curve of Speed with 33-in. Wheels.

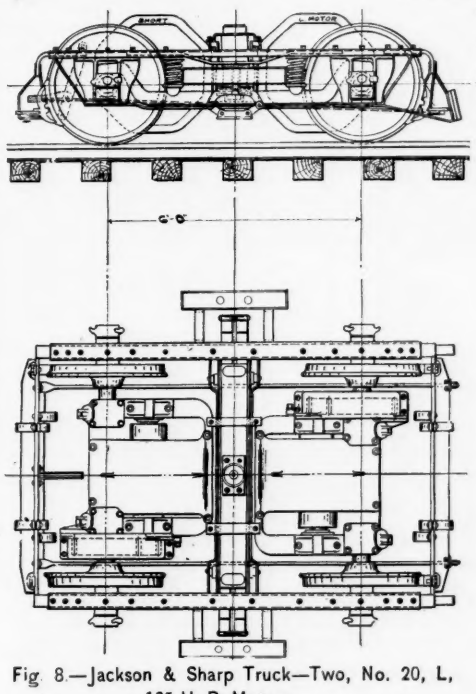


Fig. 8.—Jackson & Sharp Truck—Two, No. 20, L, 125 H P. Motors.

For the convenience of engineers making calculations for the required current in amperes at 500 volts pressure, which will be necessary to operate a given line of road with trains as specified above, we give a table showing the maximum current consumed by trains during acceleration; the current necessary to operate the trains at full speed and the average current and horse-power for the various trains.

CURRENT CONSUMED BY TRAINS OF STANDARD ELEVATED CARS.

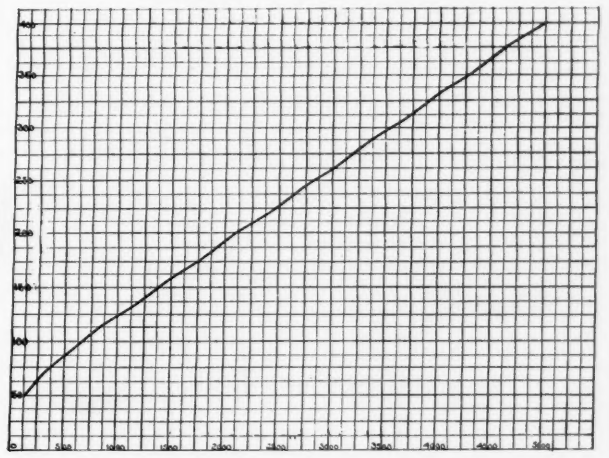
Number of cars.	Accelerating current.	Full speed current.	Average current.	Average horse power.
1	2 0	90	180	121
2	5 0	175	227	152
3	780	190	348	231

MOTOR BEST SUITED TO ELEVATED SERVICE.

There being neither dust nor water to contend with, the motor can be left entirely open, for the free circulation of air over the armature and field magnets, and *not only thorough ventilation*, but 20 per cent. more output can be obtained from a given machine in this way. The open motor can be much more easily inspected and kept free from oil and grease.

The accompanying drawing (Fig. 17) shows the form of motor which we have designed for elevated railroad service.

This motor is intended to be taken apart by running the truck from under the car, and lifting the upper half of the magnetic ring by means of an overhead crane; this exposes the armature, left with its bearings in the motor frame, which is journaled to the car axle at one side and supported by the truck bolster at the other side. The motor frame has cast integral with it the lower half of the magnetic ring. Each half of the magnetic ring has two pole pieces, wound with a few turns of heavy copper ribbon, so that the magnetic system of the motor is symmetrical, and of very large sectional area, to provide for the rapid acceleration control, which will be discussed later.

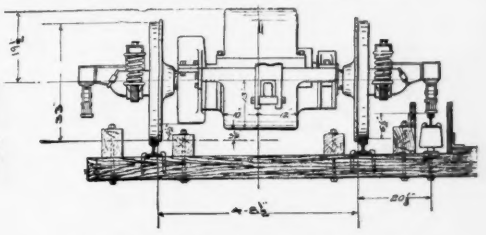


Horizontal Effort in Pounds.

Fig. 7.—No 25, L, 200 H. P. Motor—Curve of Horizontal Effort with 33-in. Wheels.

The magnetic ring is large in diameter and the axle is made to pass inside the ring, between the magnet coils, so that the distance between the gear centers is short. This makes the gears small in diameter and gives a large clearance above the stringers inside the rails.

The armature is especially large and heavy, provided with deep slots to secure the bar winding, which makes but one turn per commutator bar. By this means the self-induction of the armature windings is reduced to a minimum, and there is a very low voltage between the commutator bars, providing for perfectly sparkless commutation. Bronze is used for both the armature and axle bearings, and the lubricant is oil instead of grease. The brasses are so arranged that the thrust caused by the gears brings the shafts against solid unbroken surfaces. The oil is stored in cellars and is carried to the bearings by means of waste which wipes the entire length of the shaft within the brasses. Provision is made at the ends of the bearings to collect all the oil which may escape and return it to the cellars to prevent a drip on the structure and street beneath. The bearings are made exceedingly long and the shafts are large in diameter, the pressure per square inch being reduced to the very low value of 37 lbs. The armature bearings are solid and are lifted out of the motor together with their oil cellars when the armature is removed by an overhead crane.



The gear housing is made of heavy cast iron in halves, the lower half being permanently fastened to the motor frame, while the upper half may be lifted off independently by the overhead crane. The housing is grease tight and the gears run in oil. The entire motor is cast from the best quality of steel.

The Control.

The motors are controlled by a series parallel con-

troller, which provides for keeping a constant current through each of the motors of such a quantity as will just avoid slipping the wheels during the time of acceleration. We have named this the "maximum constant current acceleration controller." In order to accomplish this kind of a control, the counter electro-motive force of the motors is prevented from rising until the train has reached the maximum speed at which it is desired to operate it. The counter e. m. f. is then instantly raised

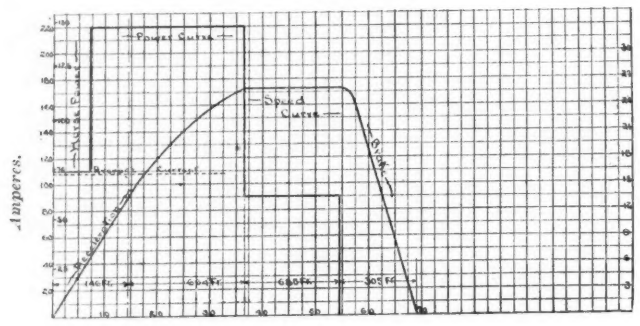


Fig 13.—28½-Ton Car—Two, No 10, L, 60 H P. Motors—Schedule 15
Miles an Hour—1,800 ft between Stations

to a point which reduces the current to a quantity which produces a horizontal effort sufficient to overcome the resistance of the train and maintain a constant speed.

The accompanying diagram (Fig. 18) shows the acceleration curve of an ordinary series parallel controller and two series motors; also a curve of the constant current method of control, with two motors of the same

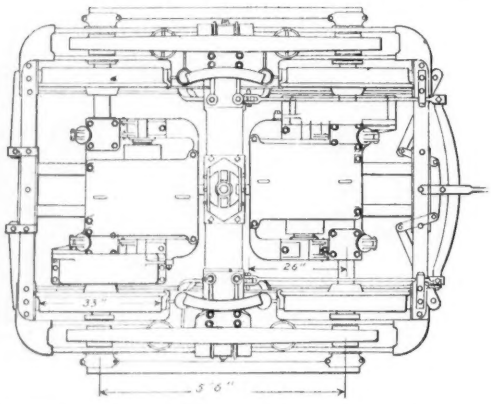


Fig. 12.—McGuire, Brooklyn Bridge Truck—Two No. 10, L, 60 H. P. Motors.

size. The advantages of this latter method are apparent in the decrease of the schedule time and the decrease of power consumption.

The Brakes.

Westinghouse automatic air-brakes are used on all trains, with a brake applied to every wheel, enabling a train to be brought to a stop

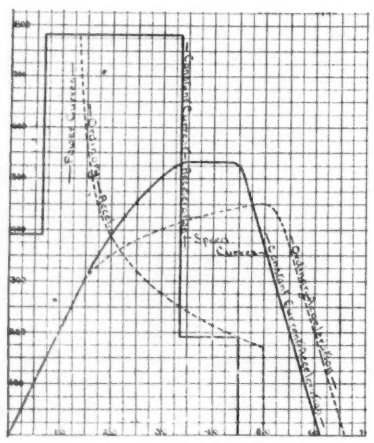


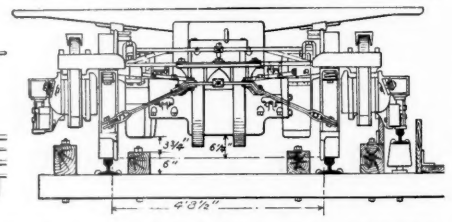
Fig. 18.

with a negative acceleration of 3 ft. per second, which is not disagreeable to pasesngers.

The train-pipe for this system of brakes is fed with air from a main reservoir attached to one side of the truck bolster of the idle truck of the motor car, as illustrated the drawing (Fig. 19) On the other side of the truck bolster is attached an electric-motor air-compressor, as illustrated. The motor is arranged to automatically stop and start under the influence of the varying pressure in the main reservoir. The object of putting the air-compressing apparatus on the truck instead of on the car body is to avoid the disagreeable noise due to the operation of the pump and to facilitate repairs, as the truck with its entire air-compressing outfit is run out from under the car in the same manner as the motor truck.

Third Rail Feeder System.

A third rail of varying section should be mounted



throughout the entire length of the road on substantial insulators. Heavy rails should be laid near the station, and gradually taper off to the ends of the road. For most "L" roads, it is not necessary to use auxiliary feeders of any kind, as the entire power necessary to operate all trains can be carried by the third rail. This rail should be placed on one side of the track with its head some inches above the track rails, so that sliding shoes made of cast iron and attached to the trucks may slide freely along their upper surface (Drawing No. 20).

The appended table Fig. 21. shows the amount of power which rails of different sections can carry, with a drop of 100 volts per mile, when all the power is delivered at the end of the mile. Of course the same amount of power can be distributed with the same drop over two miles of track. The table also shows the relative cost of this method of distribution as compared with copper feeders.

Bonding.

All rails, as far as practicable, should be in 60-ft. lengths. The third rail, as well as the track rail, joints

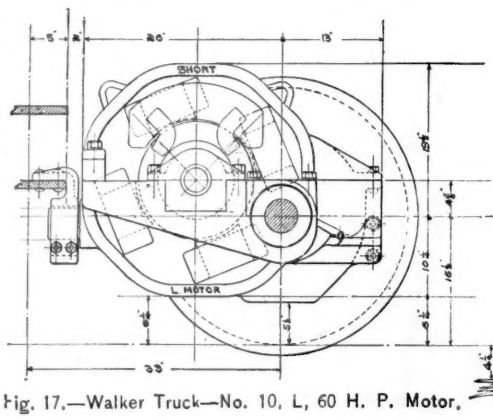


Fig. 17.—Walker Truck—No. 10, L, 60 H. P. Motor.

should be bonded by a flexible copper bond, attached to the under side or the foot of the rail by means of a number of rivets, and the area of contact with the rail should be sufficient to provide that not more than 100 amperes per square inch should be required to pass through the joint between the steel and copper.

The sectional area of the bond must be one-sixth the sectional area of the rail itself.

The track rails should be electrically connected frequently with the elevated structure.

Care should be taken that all joints between copper and steel should be made with clear, bright surfaces, and no space be left to admit water or air to corrode the joints.

TRAIN NO 1.—ELEVATED RAILROAD SERVICE.

Number of cars in train	3
Full speed of train on level track (miles per hour)	31

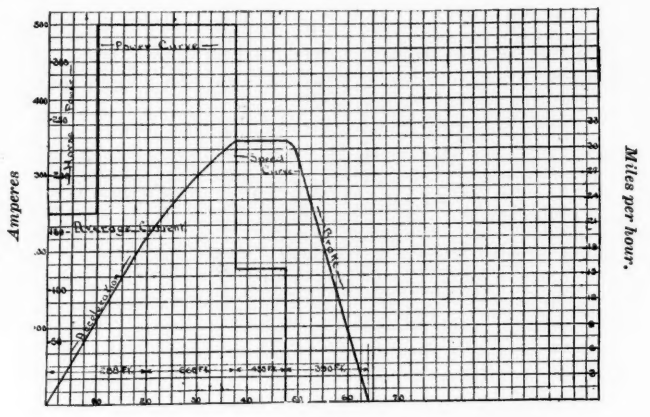


Fig. 11 —Two-Car Train—Two No. 15, L, 125 H P. Motors—Schedule 15.8
Miles an Hour—1 800 ft. between Stations.

Average speed, stops one-third mile apart (miles per hour)	16.5

Motor Car.

Weight of motor car body	10 tons
Weight of both trucks	10 tons
Weight of two motors	7 tons
Weight of 75 passengers	5 tons
Total weight of loaded motor car	32 tons

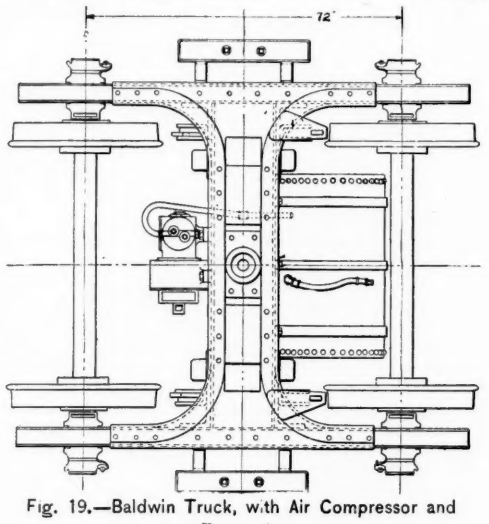
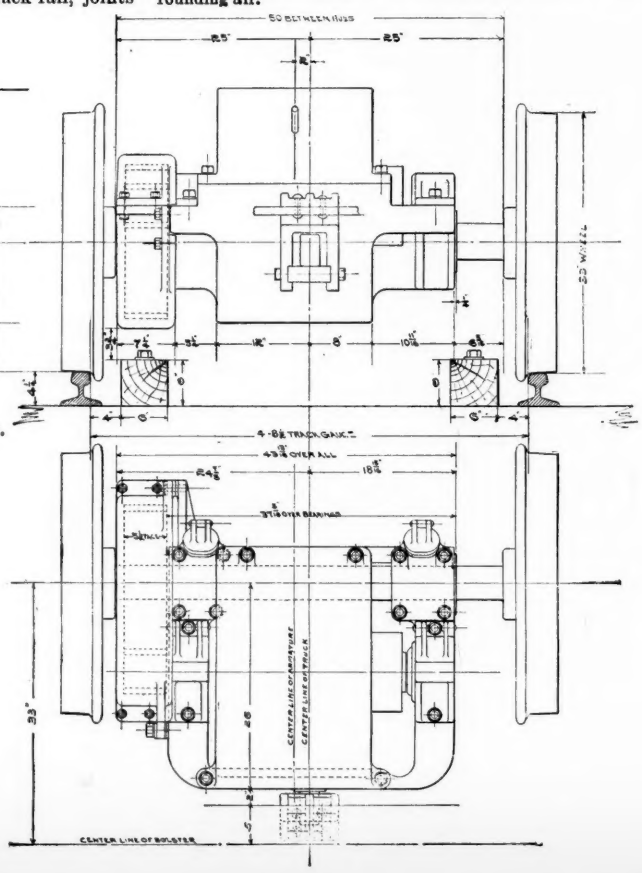


Fig. 19.—Baldwin Truck, with Air Compressor and Reservoir.

Number of motors on motor car	2
*Commercial rated power of each	200 H. P.
Safe constant load for each	100 H. P.

*This motor will deliver the commercial rated output for one hour without heating more than 75 deg. C. above the surrounding air.



Safe temporary tractive effort of equipment.....10,000 lbs.
Safe constant " " " " " .....3,500 lbs.
Weight on drivers.....19.5 tons
Ratio of weight on drivers to total weight. .....26 per cent.
Adhesive power.....9,750 lbs.
Ratio safe temporary tractive effort to adhesion..100 per cent.
" " constant " " " " ..36 per cent.

Complete Train.

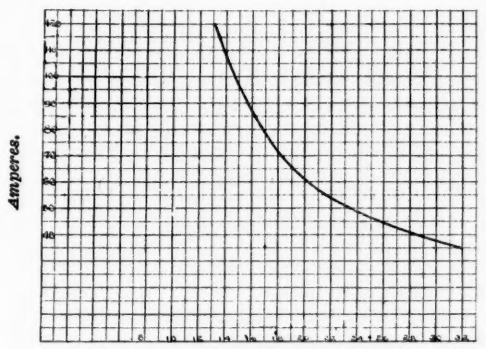
Total weight of loaded motor car.....32 tons
Weight of two coaches .....32 tons
Weight of 150 passengers in coaches.....10 tons
Total weight of loaded train..... .....74 tons
Maximum horizontal effort in accelerating train.....9,750 lbs.
Horizonal effort per ton during acceleration.....132 lbs.
Maximum power in accelerating uniformly to full speed .....412 H. P.
Maximum current at 500 v. accelerating uniformly to full speed.....780 amp.
Time required in accelerating uniformly to full speed...34 sec.
Distance in which train will acquire full speed.....900 ft.
Horizontal effort, train running uniform speed.....1,300 lbs.
Power consumed " " " " .....106 H. P.
Tractive effort per ton " " " .....18¾ lbs.
Maximum practical negative horizontal effort in braking .....13,800 lbs.
Time required to bring train to full stop.....16 sec.
Distance traversed by train during braking.....370 ft.

Train Performance.

Track.	H. P.	Current at 500 volts.	Speed in miles per hour.	Horizontal effort.
Level.....	106	190 amp.	32	1,300 lbs.
1 per cent. grade....	170	290 "	22	2,780 "
2 " " " ...	235	400 "	20 8	4,260 "
3 " " "	295	505 "	19	5,740 "

TRAIN NO. 2.—ELEVATED RAILROAD SERVICE.

Number of cars in train.....2



Speed in Miles per Hour.

Fig 15.—No. 10, L, 60 H. P. Motor—Curve of Speed with 33-in. Wheels.

Full speed of train on level track (miles per hour).....31
Average speed, stops one-third mile apart (m. p. h.)..... 15 8

Motor Car.

Weight of motor car body..... 10 tons
Weight of both trucks..... 10 tons
Weight of two motors..... 5.5 tons
Weight of 75 passengers..... 5 tons
Total weight of loaded motor car..... 30.5 tons
Number of motors on motor car..... 2
*Commercial rated power of each.....125 H. P.
Safe constant load for each.....60 H. P.
Safe temporary tractive effort of equipment..... 5,600 lbs.
Safe constant " " " .....1,600 lbs.
Weight on drivers..... .....18 tons
Ratio of weight on drivers to total weight.....35 per cent.
Adhesive power.....9,000 lbs.
Ratio safe temporary tractive effort to adhesion...62 per cent.
" " constant " " " ...18 per cent.

Complete Train.

Total weight of loaded motor car.....30.5 tons
Weight of one coach..... .....16 tons
Weight of 75 passengers in coach..... ..... 5 tons
Total weight of loaded train.....51.5 tons
Maximum horizontal effort in accelerating train.....5,640 lbs.
Horizontal effort per ton during acceleration .....109 lbs.
Maximum power in accelerating uniformly to full speed.....280 H. P.
Max. current at 500 v. accelerating uniformly to full speed..... 500 amp.
Time required in accelerating uniformly to full speed 37.5 sec.
Distance in which train will acquire full speed.....953 ft.
Horizontal effort, train running uniform speed.....1,000 lbs.
Power consumed, " " " " .....115 H. P.
Tractive effort per ton, " " " .....19.7 lbs.
Maximum practical negative horizontal effort in braking .....11,000 lbs.
Time required to bring train to full stop.....16 sec.
Distance traversed by train during breaking.....390 ft.

*This motor will deliver the commercial rated output for one hour without heating more than 75 deg. C. above the surrounding air.

TRAIN NO. 3.—ELEVATED RAILROAD SERVICE.

Number of cars in train..... 1
Full speed of train on level track (miles per hour).....26
Average speed, stops one-third mile apart..... .. 15

Motor Car.

Weight of motor car body.....10 tons
Weight of both trucks.....10 tons
Weight of two motors..... 3.5 tons
Weight of 75 passengers..... 5 tons
Total weight of loaded motor car.....28.5 tons
Number of motors on motor car 2
*Commercial rated power of each..... .. 60 H. P.
Safe constant load for each ....25 H. P.
Safe temporary tractive effort of equipment.....3,300 lbs.
Safe constant " " " " .....760 lbs.
Weight on drivers.....16 tons
Ratio of weight on drivers to total weight..... .....56 per cent.
Adhesive power..... 8,000 lbs.
Ratio safe temporary tractive effort to adhesion...41 per cent.
" " constant " " " " ... 8 per cent.
Maximum horizontal effort in accelerating train ... 2 600 lbs.
Horizontal effort per ton during acceleration.....91 5 lbs.
Maximum power in accelerating uniformly to full speed.....122 H. P.
Maximum current at 500 v. accelerating uniformly to full speed .....220 amp.
Time required in accelerating uniformly to full sped.36.5 sec.
Distance in which car will acquire full speed..... .....810 ft.
Horizontal effort, train running uniform speed.....712 lbs.
Power consumed, " " " " ....51 H. P.
Tractive effort per ton, train running uniform speed....25 lbs.
Maximum practical negative horizontal effort in braking.....5,300 lbs.
Time required to bring train to full stop.....14.5 sec.
Distance traversed by train during braking.....305 ft.

Train Performance.

Track.	H. P.	Current at 500 volts.	Speed in miles per hour.	Horizontal effort.
Level	51	90 amp.	26.	712 lbs.
1 per cent. grade....	68	124 "	19.9	1,282 "
2 " " "	85	154 "	17.2	1,832 "
3 " " "	101	182 "	15.5	2,422 "

COMPARATIVE TABLE OF STEEL AND COPPER FEEDERS.

Steel rails.		Equivalent Copper cable.		Current transmitted one mile. 100 volts drop.	Horse-Power transmitted.
Pounds per yard.	Cost per mile.	C. M.	Cost per mile.		
50	$774	910,000	$2,090	1,640	1,100
55	851	1,000,000	2,300	1,800	1,210
60	928	1,091,000	2,510	1,970	1,320
65	1,005	1,182,000	2,720	2,130	1.439
70	1,110	1,273,000	2,930	2,300	1,540
75	1,188	1,364,000	3,140	2,460	1,650
80	1,268	1,455,000	3,350	2,620	1,760
85	1,450	1,546,000	3,560	2,790	1,870
90	1,535	1,637,000	3,770	2,950	1,980
100	1,705	1,819,000	4,190	3,280	2,200

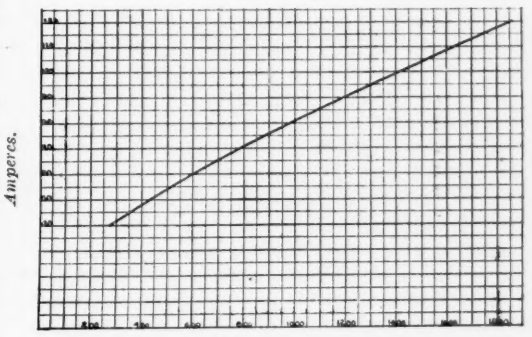
Test of New Niagara Bridge.

On Thursday of last week the official test of the new steel arch over the Niagara gorge took place. The lower deck (highway and trolley deck) was not loaded, it being hardly practicable to put on load enough to make any difference in the deflection. Trains were run over the two railroad tracks on the upper deck, starting at the Canadian side and running across to the American side, stopping to permit levels to be taken at seven different points. These trains consisted of heavy engines, consolidation and 10-wheelers, with coal cars loaded to 60,000 lbs., and rails added to bring their total weight up to 3,000 per lineal foot. The bridge is designed for a total moving load of 10,000 lbs. per lineal foot, but the load at the test probably was not more than 7,000 lbs. The maximum deflection observed was ⅞ of an inch on one side and 1 in. on the other. The calculated deflection for the load of 10,000 lbs. per lineal foot, was 4½ in. It was to have been expected that the bridge would be very stiff under the test, not only because of its massive and rigid construction, but because it had been used under traffic for a number of weeks and the joints had pretty well settled to their bearings. Several days of rain before the day of the test and an extremely stormy morning undoubtedly prevented a number of people from being present who otherwise would have been. Among those who were there were Mr. Joseph Hobson, Chief Engineer of the Grand Trunk; Mr. McGuigan, General Superintendent of the Grand Trunk; Mr Burroughs and Mr. Thomas R. Merritt, Presidents of the Niagara International Bridge Companies; Mr. James A. Sperry, of the New East River Bridge Commission; Mr. L. L. Buck, Chief Engineer of the bridge; Mr. R. S. Buck, Resident Engineer; Mr. Fream, Superintendent of Erection, and Mr. W. H. Breithaupt, C. E., of New York.

* This motor will deliver the commercial rated output for one hour without heating more than 75 deg. C. above the surrounding air.

Webb's Four-Cylinder Simple Engine.

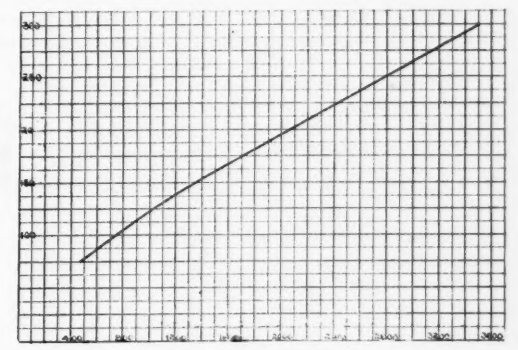
Mr. F. W. Webb has just finished a new express engine for the London & Northwestern which presents some novel features. It has four driving wheels 7 ft in diameter and four leading wheels 3 ft. 6 in. diameter.



Horizontal Effort in Pounds.

Fig 14.—No. 10, L, 60 H P. Motor—Curve of Horizontal Effort, with 33-in. Wheels

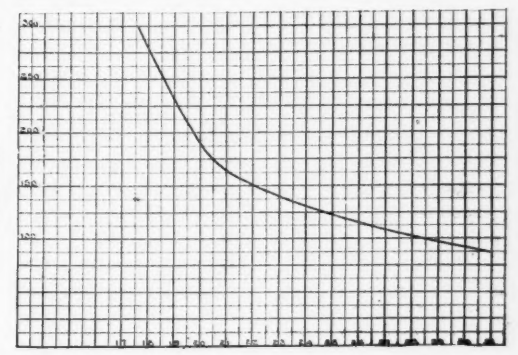
There are four cylinders, two inside and two outside, each 15 in. in diameter, the valves being operated by a special arrangement of Joy's gear. It has an extended



Horizontal Effort in Pounds.

Fig 10.—No. 15, L, 125 H P. Motor—Horizontal Effort and Current Curve.

smokebox on which is mounted a double stack, one exhaust being discharged up each chimney. A horizontal plate divides the smokebox into two chambers, and one



Miles per Hour.

Fig. 9.—No. 15, L, 125 H. P. Motor—Speed and Current Curve.

of the chimneys is carried down through this plate into the lower chamber, and the exhaust up this chimney consequently draws the fire through the lower rows of flues. The other chimney opens into the top of the smokebox in the usual way, and the exhaust through it creates a suction through the upper flues, thus, to a certain extent, furnishing a means of equalizing the draft. The engine is named "Iron Duke," and weighs 50 tons.

Mr. Webb is also building another engine similar to this, but on the compound principle, having two high pressure cylinders of 15 in. diameter, and two low pressure cylinders of 19¼ in. As the boiler pressure (175 lbs.) will be the same in both engines, the comparative tests which are to be made will be watched with interest.

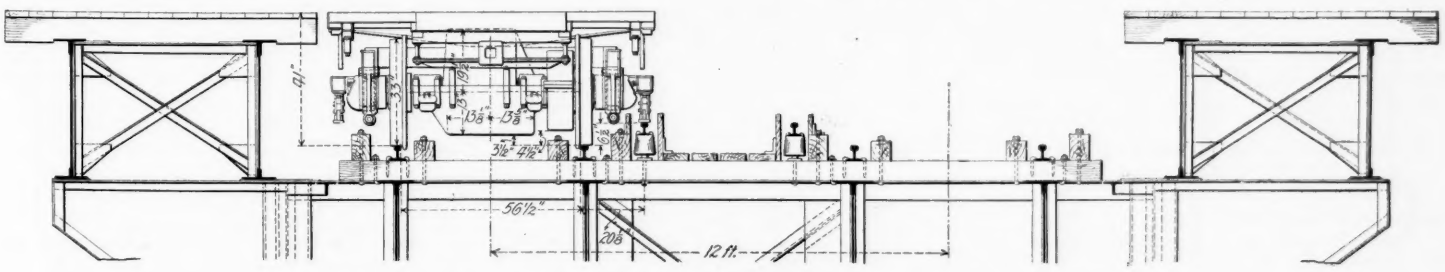


Fig. 20.—Walker Arrangement of Motor Car for Elevated Railroad—No. 25, L, 200 H. P. Motor.

Train Performance.

Track.	H. P.	Current at 500 volts.	Speed in miles per hour.	Horizontal effort.
Level.....	92	175 amp.	31	1,013 lbs.
1 per cent. grade,....	135	250 "	24.8	2,143 "
2 " " "	176	320 "	21.3	3,073 "
3 " " "	220	390 "	19.9	4,103 "

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
Published Every Friday,
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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The officers of the Manhattan Railway Company are very amiable in allowing inventors or promotors to try their devices on the tracks of the elevated railroad. Probably it is good policy for them to be liberal in this way, especially because of the effect of this liberality on the public mind; but they must often find it a great bore. Last Monday an alleged oil-burning locomotive appears to have had some kind of a trial on the elevated. We are told by one reporter that it took 20 minutes to get up a pressure of 145 pounds of steam and by another reporter that it took "an hour's maneuvering" before the train was started. They all agree that the locomotive emitted a dense smoke; that it had very hard work to haul the train up a grade and that finally the steam pressure fell to helplessness. Of course, every well-informed officer of the mechanical department of the railroads knows that this matter of burning oil in locomotives was thoroughly worked out as much as 10 years ago. It has been demonstrated that mechanically it is a very easy matter to use oil fuel and that in many respects such fuel is ideal; and that with the least care and intelligence it can be burned with absolutely no smoke. In the United States the only question is commercial. It would take one-third of the petroleum supply of the country to run the locomotives of the Pennsylvania Railroad alone; and no railroad, great or small, can afford to put itself in the hands of the Standard Oil Company, so far as its locomotive fuel is concerned (although a good many of them seem to be in the hands of that company in the matter of lubrication). It is common knowledge that petroleum fuel is very much used on the locomotives in Southeastern Russia, and has been for years. It is also common knowledge that many locomotives have been successfully run with petroleum fuel in Southern California in very recent years. Indeed there is no lack of information, theoretical and experimental, on this subject. Therefore, there is no excuse for putting on the track a locomotive which cannot burn oil without smoking and which cannot keep up steam pressure with oil fuel.

On another page will be found an interesting review of the subject of rope transmission from a paper by Mr. Staunton B. Peck, before the Western Society of Engineers. On account of the author's extended experience in designing and building rope drives his opinions, in such matters as are still open questions, have great weight. Still they will not be accepted by everyone. For instance, the separate rope system, used largely in England, is mentioned in connection with its disadvantages when compared with continuous rope transmission. There is, however, one feature of the separate rope system, not mentioned, which is of considerable importance, namely, if one of the ropes breaks it is not necessary to stop the machinery to put on another rope, whereas if the continuous rope breaks, the entire machinery must stop. A statement which does not altogether bear out the results of English practice is that special made manilla rope is more durable than either cotton or hemp. Possibly so, but cotton has advantages which often lead to its preferment—and in cotton and woolen mills for ropes less than one inch in diameter, we suppose that cotton is used almost exclusively in England and in this country, and in England cotton ropes even larger than one inch in diameter are often considered superior to manilla ropes for transmission purposes. This very convenient and economical means of transmitting power has probably not had the consideration from railroad shop men that it deserves. It is common to railroad shops either to have the boilers centrally located with a separate engine in each building, to which steam is carried through pipes, or to have separate boilers and engines in the different shops. On account of the arrangement of the buildings and the amounts of power needed, the average railroad shop is a place for which rope drives are particularly adapted. Such drives, for limited distances, could in many cases be installed at less cost and run cheaper than any other means for distributing power to the different buildings. There are, however, many things to be considered in arranging for such transmissions, and beside the general information and data, one of the most important points in Mr. Peck's paper is that, "rope transmissions should be designed with intelligence and judgment based on experience." For those who care to look further into this matter we can recommend the excellent little manual "Rope Driving," by Professor Flather, published in 1895 by Wiley.

The Chicago Great Western has made a somewhat radical change in the organization of the operating department, as described in another column of this paper. Technically, the new plan is not novel, for the Chicago & Alton, a road of about the same length, and doing, perhaps, twice as much business, has no division superintendents; and some roads which got along without division superintendents in ancient times, before that title was invented, still intrust varied and important responsibilities to men with no higher title than station agent. On the Minneapolis, St. Paul & Sault Ste. Marie, where some station agents have authority over trains, it is reported that a number of agencies have lately been filled by the promotion of locomotive runners, the candidates being first put through "a short course of training in the office." This plan was adopted, it appears, with a view to placing over the enginemen officers who should know the enginemen's work so thoroughly that there should be no friction in the execution of orders; or, in plainer speech so thoroughly that runners inclined to be unruly could have no chance to take advantage of their superior because of his ignorance. It will be seen that an element of a similar nature had its influence in the Chicago Great Western change. We do not know that either of these changes ought to be a subject of criticism, and we do not mention them for the purpose of criticising; the efficiency of an organization depends in such large measure on the personal character and ability of the officers and on the facility with which they can communicate with the men with whom they have to deal, that no one who is not on the ground can assum to find fault with a mere change of title or of the location of an office; but we are impelled to inquire whether such changes of form without corresponding changes of substance are worth the friction and gossip set on foot. To change titles and jurisdictions of officers often seems to be the least objectionable way of covering up a reduction of salaries but we doubt whether it is worth while to take the trouble to cover up the reduction at all. The public like to feel that they are dealing with a superintendent, and if an agent has superintendent's functions, why not give him the title, whatever the salary? Possibly the changes under consideration have been made on the theory that at stations 100 or 500 miles from headquarters the employees must have a well-qualified officer on the ground, with whom they can deal, while the public can be left to deal with the general officers, by letter or telegram or as best they can. It seems to us that nothing but a great stringency in the treasury can justify such a backward step as that. As for giving an engineman a short office training to make him fit to be an agent, how much better is that than giving a station man a short course in locomotive work? The agents at smaller stations who aspire to higher positions may very reasonably urge this point.

The World's Railroads.

The *Archiv für Eisenbahnwesen*, published by the Prussian Ministry of Public Works, which has for many years compiled statistics of the railroads of the world, and has unusual facilities for securing them, in a recent number extends its tables so as to cover the year 1895. The tables give the mileage in each country for five years, the increase from 1891 to 1895, and proportion of mileage to area and population. A conversion of the columns of these tables which give absolute length and length relatively to area and population, appeared in our issue of June 4 of this year. In that re-publication we have found a slight error, due to careless proofreading. The miles per 100 square miles of area and per 10,000 of population, in the case of Australia, should read 0.3 and 32 6, respectively.

We will now consider some of the general comparisons which appear from the details of the tables; and, first, for the five great divisions of the globe, the miles of railroad and the changes from 1891 were as below:

	Miles.		Increase.	P. c.
	1895.	1891.		
Europe	155,284	141,552	13,732	9.7
Asia	26,890	22,023	4,867	22.1
Africa	8,169	6,522	1,647	25.2
America	229,722	212,724	16,998	8.0
Australia	13,888	12,322	1,566	12.7
The world	433,953	395,143	38,810	9.8

Thus the world's railroads in 1895 reached the stately length of 433,953 miles—more than 17 times the length of the equator; and in the four years since 1891 they had grown nearly one-tenth, by the length of 38,810 miles. But this has been a period notable for a decline in the construction in this country, which has in some periods of four years built almost as much as the whole world in this 1891–95 period (1879–1883, 34,861 miles; 1885–89, 33,034 miles); while in the period under consideration it built only 11,1.0 miles. The percentage of increase in Europe was greater than in America, which has not happened before for a long time. America, however, has much more railroad than all the rest of the world together.

Asia, the largest and most populous continent, has about one-sixteenth of the world's railroad, but recently it has been building faster than heretofore. More than two-thirds of the Asiatic railroads are in British India, and not far from one-half of the increase from 1891 to '95 was there. The other chief Asiatic increase was through the beginning of the Siberian Railroad. But Japan stood next to India among Asiatic countries in 1895, and the Dutch Indies next to Japan.

The percentage of increase in mileage was greater in Africa than in any other continent, but this great percentage was only 1,647 miles. The South African Republic led in new construction, building 491 of its 616 miles between 1891 and 1895. Cape Colony followed, and it has more railroads than any other African country, followed by the French possessions, Algiers and Tunis. Egypt made an addition of 31 per cent. to its mileage in the four years in question, as did also the Orange Free State. Just about half of the African mileage is in the comparatively small area of South Africa.

The additions to mileage in Australia were comparatively small. Compared with its population it is better provided with railroads than any other continent—a mile for 306 inhabitants, while Europe has a mile to 2,438, America a mile to 566. Asia has so many people and so few railroads that it is not fairly to be compared, but it has probably about 28,000 people for every mile of railroad.

Among European countries the rank in mileage is as follows: Germany, France, Russia, Great Britain and Austria. No other country has so much as 10,000 miles. The largest increase in mileage since 1891 has been in Russia—4,146 miles and 21.4 per cent. No other country in Europe added half so much to its mileage. But Spain gained 18.3 per cent. and Sweden 17.7 per cent. The gains in France, Germany and Austria-Hungary were from 6½ to 7 per cent.

It appears from this that the European countries recently most active in extending their railroad systems are those which have been most backward and consequently have most room for railroads. The great field for construction in Europe is Russia, where the 23,455 miles reported (including Finland) have to serve a population of 106 millions (by the census taken this year) and an area 2,096,000 square miles, so that equally spaced over the whole territory the railroads would be 88 miles apart. Making all possible allowances for the inclement and very thinly peopled North of European Russia, it is evident that the country will be able to support a much larger mileage.

Asiatic Russia, which has three times the area of European Russia, but has only one-fifth of its population, and that mostly in the Caucasian territory between the Black Sea and the Caspian, forms no such field for the development of traffic, being very largely arid or arctic—the cold in eastern Siberia being very much greater than in the same latitude in Europe,

even Eastern Europe. The other great fields for construction are in China and in Asia Minor, where production and population are amply sufficient and the obstacles consist in the character of the people and their governments. With railroads sure soon to reach the Chinese frontier in British Burmah, French Tong King and Russian Siberia, it seems impossible that they should be much longer kept out of the country, to say nothing of the effect to be expected from the lines already authorized in northeastern China.

The new countries of the world have generally provided themselves with railroads close up to the growth of population and production to support them. This is indicated by the very small population per mile of railroad in Canada, the United States, Australia and even in the Argentine Republic. It is only by utilizing this means of transportation that they have been able to make their rapid growth and add so enormously to the world's food supply, etc. It is not possible that they can long increase their railroads faster than their population grows, for the existing railroads are, as a whole, insufficiently supported by the present population. In this country, at present, an addition of 3,000 miles to our railroad system will leave the population per mile practically unchanged. There was one year when we built 13,000 miles of railroad, and that alone reduced the population per mile of road from 422 to 396, while from 1880 to 1890, having built 74,500 miles of railroad in the decade, the population per mile to support the railroads fell from 580 to 388—just about one-third. Canada and Australia have a still smaller population per mile than this country, where it has changed but little since the last census.

Of course, the mileage which a given population requires and can support varies enormously, and not only with production, but with the conformation of the country and the nature and distribution of its industries, and the habits of the people; but there evidently is a limit to the mileage which a certain number per mile can support, and in every new country the tendency is to press closely on that limit, not only by the demands of land-owners, who can only gain an income from their possessions by making them accessible, but by the capitalists who invest, eager to build a line which, though it may not yield three per cent. for the first five years, may in time yield six or more per cent., and most of all by the speculators who hope to capitalize the increase in earning capacity if it comes soon enough, and who usually manage to have the losses fall on some one else if the hoped for prosperity does not come.

The *Archiv* gives no detailed statistics of capital, but makes the statement that the average capital per mile is $120,440 in Europe and $59,310 in the rest of the world, or a general average of $88,140. The aggregate capital of all railroads is $35,216,000,000, which is about $24 for each inhabitant. Of this whole capital $18,695,000,000, or 53 per cent. of the whole, is invested in the European railroads, which have but 36 per cent. of the whole mileage.

The Counterbalance Tests of the Strong Locomotive.

The recent counterbalance tests of the Strong locomotive, made on the testing plant at Purdue University, have a certain interest as carrying further the accurate observations which Professor Goss has been able to make of the various movements of an engine, relatively to the track, at different speeds; but we question if they have any great practical value to locomotive builders or users, and they add little to the useful information already made common property by the publication of results of earlier tests.

At the meeting of the American Society of Mechanical Engineers held in New York, December, 1894, the question of the locomotive counterbalance was very thoroughly presented and discussed. During that discussion the design of Mr. Geo. S. Strong for a perfectly balanced engine was described, and neither at that time nor since, so far as we know, has anyone contended that Mr. Strong's arrangement would not overcome entirely the difficulties attending the use of an "excess balance." The announcement, that the tests of the Strong locomotive show the engine to be perfectly balanced, will therefore not be received with surprise. The principles underlying the design are so simple and so well understood that elaborate tests were hardly necessary to demonstrate the correctness of the theory. The tests show, mainly, that the actual work of building the engine has been done in conformity with a design based on theoretically correct principles, and further, that no appreciable errors have been made either in working out the details of the design or in carrying on the tests. But it can scarcely be expected that on account of these tests the Strong method of balancing locomotives will be viewed with greater favor by railroad men.

It has been generally known for the past three years that the Strong design of balanced locomotive would overcome the difficulties incident to counterbalancing, and still railroads and locomotive builders have continued to build engines in much the same manner as before, and without radical changes, merely reducing the weight of the reciprocating parts and increasing the diameter of driving-wheels to suit the speed, thereby avoiding damage to the track by the "excess balance." The objection which has been made to Mr. Strong's design from the start is that it requires two additional inside cylinders, a double crank axle and two extra crossheads, main rods, guides and valves, which makes an arrangement expensive and wholly impracticable for railroads in this country.

In a paper, "Rail-Pressures of Locomotive Driving-Wheels," by Mr. D. L. Barnes, presented at the meeting of the American Society of Mechanical Engineers previously referred to, the following is one of the conclusions: "The only practical way in which the excess balance can be reduced is by reducing the weight of the reciprocating parts, and as these parts are generally made heavier than the service demands, it is possible to reduce the excess balance to a point where the rail pressures will not be destructive, provided that the diameter of the drivers be made suitable for the speed."

In the discussion of this paper, in speaking of the Strong design for balancing locomotives, Mr. Barnes made the following remarks: "I am sure that no one who has the care of locomotives would want four cylinders in the place of two if it can be avoided. Four cylinders and no excess balance, on any practical plan of construction, means a double-crank axle, two extra sets of guides, two extra crossheads, main rods and steam valves and at least one extra set of valve motion parts or their equivalents. All of this extra machinery would be used for the purpose of doing away completely with the excess balance, which is not the end sought. What is wanted is to get rid of damage from the excess balance, and this can be done by reducing the weight of the reciprocating parts, as is now done in Europe, and has been done for torpedo-boats and other engines. In the face of the fact that a reduction of the reciprocating parts that will remove all damage to the track from the excess balance can be easily and inexpensively made, I feel that I am justified in claiming that such reduction is the simple and economical way of reaching the desired end and therefore it is the only practical way."

We know of no developments within the last few years which would make Mr. Barnes' statements less true to-day than they were three years ago; in fact the tendency has all been, as before mentioned, to lighten the reciprocating parts and increase the diameter of the drivers of high speed locomotives.

Railroads take so much pains to accommodate passengers, that people often unconsciously assume that the railroad will always do everything possible for them, even where the cost would be so great as to make the transaction ridiculous. But this assumption sometimes falls through, as in a case recently decided by the Indiana Appellate Court. A passenger secured a round-trip ticket from Lafayette to Paisley and return. By its terms he was required to sign his name, with the station agent at Paisley as a witness, before starting on the return trip. The ticket was good for several days, and during the interim the holder went on to Chicago. Returning from that city he took a train which brought him into Paisley at 10:30 p. m. On going to the ticket office for the purpose of securing the necessary witness, he found it closed; and, on boarding his train and offering the unindorsed ticket, he was met with a refusal to receive it. No fare being forthcoming the conductor ejected him. Whereupon suit was brought against the company, and the Circuit Court gave him $100, plus the cost of the action. The Appellate Court reversed this verdict, and held that the regulation was a reasonable one which required him to secure the station agent at Paisley as a witness to his own indorsement of the ticket; that the company was not obliged to keep its station agent on the premises beyond the usual business hours of each day, and that the passenger by accepting the ticket at its reduced rate was bound to comply with the regulations that accompanied it, so long as they are within the compass of reason. This decision once more explodes the old but fallacious theory that a ticket unequivocally imports a right to ride between the terminals it indicates. Strange as it may appear, there are apparently well-considered cases where this contention is directly sustained, though the theory that a common carrier cannot make a special contract that may call for some abridgment of the passenger's ordinary rights is utterly untenable. Although this Indiana case involved a picayune sum, there is a precedent established that railroad managers should remember. The case is an extreme one, and the equities in favor of the passenger were about as strong as could possibly be imagined. He had paid for his ticket, all that was asked for it, and was, *prima facie*, entitled to transportation from Lafayette to Paisley and return; he was within the limits of the time prescribed; he was on a regular train scheduled to stop at Paisley; he was orderly and respectable and attempting no evasions. The only flaw in his case was the absence of the station agent's name from his ticket, and this he had been unable to secure at the time he applied, because that officer was not required by the company to remain on duty after 7 p. m. Here was an aggregation of facts that the Circuit Court regarded as justifying a departure from the strict letter of the contract, and as raising equities that well might sustain doubts as to the right of the company to resort to the extremity of ejectment; and yet the Appellate Court brushes them all aside, and holds that it was the duty of the passenger to make his application for the proper witness within reasonable business hours, and that he had no right to assume the physical presence of a station agent merely because the train stopped at Paisley some time during the night; or because at some stations an agent is on duty through the night. The decision is entitled "L., N. A. & C. v. Wright, 43 N. E. Rep. 491."

It appears that the Southern Pacific, in handling the Christian Endeavor excursion trains, ran some of its locomotives pretty long distances; and this, no doubt, was a material element in the marked success of the road in moving this very heavy passenger traffic. From a letter written by Manager Fillmore to Mr. S. A. Moss, of Montpelier, Vt., printed in the *Montpelier Watchman*, we learn that from Ogden, the eastern terminus of the road, where 56 engines were gathered on July 4, every train was taken through without change to Carlin, 299 miles. A little coal was taken at Terrace, about half-way, if needed. The next engine-run was from Carlin to Wadsworth, 256 miles, and the next from Wadsworth to Sacramento, 189 miles, three engines thus taking a train 744 miles. Mr. Fillmore states that the fruit trains were detained only about 48 hours, the cars being held at stations where there was an ample supply of ice. Empty engines moving eastward were run, wherever possible, in trains of four or five coupled together. In addition to the ample eating facilities at stations, five extra dining-cars were kept constantly in service between Ogden and Wadsworth. Including the Christian Endeavor passengers from the north and the south, and the local California excursionists, Mr. Fillmore estimates that there were in San Francisco about 50,000 strangers, all of whom were carried there by the Southern Pacific. In his letter of congratulation to the division superintendents he says that he had found that a great many Eastern railroad men felt grave doubts as to the ability of the Southern Pacific to handle this business over its deserts and mountains; but he states that no person was injured in the slightest degree, not even a scratch, and that not a single complaint has been received from any passenger. So pronounced were the doubts of Eastern railroad men that the General Secretary of the Christian Endeavor Society, who had made inquiries in the East, and who therefore got wind of these doubts, asked to be allowed to give the Southern Pacific operating officers some points in regard to the right way of handling large excursions. He said that it was the general talk throughout the East that it would be impossible for the Southern Pacific to handle so large a crowd as would be bunched at Salt Lake on July 4. The previous articles in the *Railroad Gazette* concerning the California excursions may be found in the issues of July 9, p. 488; July 16, p. 501, and July 23, p. 517.

The stock of the Illinois Central ought to rise materially in price during the next few weeks, especially in the exchanges of New Orleans, Sioux City, Memphis, Centralia, Odin, Onarga, Ashkum and other places on the line of the road at some distance from Chicago, for the Directors have voted to let each stockholder ride over the road free to and from the annual meetings, the next one of which is to be held at Chicago on Sept. 15. Such a pass from Memphis is worth $25 or $30, and from New Orleans (923 miles) nearly twice as much, and as the time limit allows the passenger to stay in Chicago four or five days, this vote must have the effect of making each Director's name a household word throughout the territory traversed by the company's lines, and his reputation "solid." A share of stock paying a fair dividend and with a bonus worth practically five or ten times as much as the dividend, is a plum which cannot be picked off every bush. Whether the intelligence, fullness and value of the discussions at the annual meetings will be greatly enhanced by the increase in attendance which this free-ride grant will make possible is quite another question. In Massachusetts many stockholders are so hardhearted that they will ride to Boston, buy $100 worth of sealskin jackets, gloves and parlor furniture, and return home without going near the stockholders' meeting. Many of them are women, and they will unblushingly walk past the hall where the meeting is held without knowing it from a church or an art school; and some of them, doubtless, would find it difficult to tell whether they had ridden to Boston on a railroad or a flying machine; they simply know that they got there for nothing. If the meeting occurs on a Thursday they sometimes neglect the mid-week church prayer-meeting in such large numbers that in some towns it has to be given up to avoid a disgrace to re

ligion. It is to be hoped that no such unfortunate results will follow in Illinois.

The public cannot complain at any dilatoriness on the part of the railroads in hastening the return of prosperity for they seem to be putting every cent of additional income into circulation as soon as they get hold of it. Reports of increase of work in shops, and improvements requiring the employment of men and the purchase of material, are published almost as soon as the news of increased traffic, and sometimes sooner. Most of these published statements are general in character, giving no names of companies or of places, but we note that the Burlington is running all its shops 10 hours a day; that the Boston & Albany has increased working hours; that the Great Northern has employed 200 additional mechanics at St. Paul and that the Canadian Pacific shops at Winnipeg are rushed with work. All of the roads in the grain states are finding use for all their freight cars; and the state of the export grain market indicates that the activity will not be temporary.

NEW PUBLICATIONS.

Transactions of the American Institute of Mining Engineers. February, 1896, to October, 1896, inclusive. New York: R. W. Raymond, Secretary, 13 Burling Slip.

This volume (24) of the Transactions is 1,141 pages, including 25 pages of alphabetical index. It contains the papers, reports and discussions at the Pittsburgh meeting in February, 1896, and the Colorado meeting, September, 1896.

TRADE CATALOGUES.

Milling Machines and Other Machine Tools.—The Newton Machine Tool Works, Vine and Twenty-fourth streets, Philadelphia, Pa., send us their catalogue No. 33 of machine tools. The first 40 pages show the company's latest design of plain, duplex and vertical milling machines. Especial attention is called to the line of improved machines of heavy design and great capacity. A new patented system for lubricating cutters is shown. The lubricant is transmitted through the center of the cutter and injected on the tool at the work through canals in the body, keeping the cutter cool. By this means cutters can be run at a high velocity and with rapid feed. Several tools, especially designed for railroad work are shown. Besides milling machines the catalogue shows boring machines, cold-saw cutting off machines, drills and tapping machines and slotting, planing and shaping machines. The catalogue has 180 pages with alphabetical index. All of the illustrations are line engravings and not half-tones, and one good old-fashioned practice which is retained is showing machines in outline with special parts shaded.

Combined Rack-Rail and Adhesion Locomotive.

A few weeks ago the *Organ für die Fortschritte des Eisenbahnwesens* published an illustrated description of a rack-rail locomotive built on the Abt system in addition to working as a simple adhesion locomotive. It was designed for service on the Bosnia-Herzegovina State Railroad of 760 mm. (29.9-in.) gage.

There is an independent engine or driving mechanism for each system, and in each the details have been worked out with great care. The engine has great tractive power for ascending the steep grades of a mountain railroad, and also powerful retarding devices to enable the down-grade trip to be made with the greatest security. Independently of the rack-rail mechanism, the engine is a six-wheel outside-connected tank engine, the coal and water supply being carried on an extension of the main frames that carry the boiler. The outside cylinders operate the three "adhesion" axles, and between these cylinders and slightly above them, under the smokebox, are the two cylinders of the rack-rail engine. Both sets of cylinders have their valves controlled by Joy's valve gear. The reversing gear is the same for both sets of cylinders, and the reach-rod is moved by a hand-wheel and screw working in a fixed nut.

For controlling the admission of steam to the two pairs of steam-chests, a double throttle valve is placed in the dome, with a separate rod and handle for each valve. The exhaust from the four cylinders is led into the same blast-pipe, which has a single fixed nozzle. The boiler is of the straight-top form, with 958 sq. ft. of heating surface and a grate area of 17.8 sq. ft.

The locomotive is equipped with five different kinds of brake mechanism, the designers apparently having provided almost every precaution of that kind that was available. They are—1st, an ordinary hand-brake with shoes applied to the middle and rear pair of "adhesion" drivers, and operated from the foot-plate; 2d, a band-brake consisting of steel bands with metal shoes which are applied to the crank discs of the toothed-wheel axles; 3d, the air-brake for the adhesion mechanism; 4th, the air-brake for the toothed wheel mechanism, and 5th, the arrangement by which the vacuum brakes are applied to the four trailing wheels of the engines simultaneously with their application to the car-wheels in the train. As regards details, there are supplied steam-heating apparatus for the train, a speed recorder, Nathan lubricator, and two Friedman No. 7 injectors. On account of the construction of the tender-frame, this locomotive is able to pass around curves of 70 m. (230 ft.) radius. Its tractive power is sufficient to pull a load of 85 metric tons up the steepest grade of the line at a speed of 10 km. (6 miles) per hour. A table of dimensions follows:

	Adhesion system.	Rack rail system.
Diameter of cylinders	13⅜ in.	14⅛ in.
Stroke of pistons	17¾ in.	14⅛ in.
Diameter of driving wheels	31 1/16 in.	27½ in.
Diameter of trailing "	25½ in.	
Rigid wheel base	92⅛ in.	
Total " "	22 ft. 1⅜ in.	
Length of boiler tubes	11 ft. 3¾ in.	
Outside diameter of tubes	1⅝ in.	
Number of tubes	180	
Grate surface	17.8 sq. ft.	
Total heating surface	958 sq. ft.	
Steam pressure	176.4 lbs. per sq. in.	
Water capacity	951. gals.	
Coal "	3.3 tons (2,000 lbs.).	
Adhesion weight	36.5 metric tons.	

TECHNICAL.

Manufacturing and Business.

The Shiffler Bridge Co., 45 Broadway, New York City, has secured the contract for the new iron buildings for the Poughkeepsie Glass Works, Poughkeepsie, N. Y., consisting of a furnace building 120 × 200 ft., a shop building 183 × 39 ft. and a machine shop 39 × 42 ft. The company is also furnishing and erecting the steel work in the Henry McCadden Memorial Hall, Brooklyn, N. Y.

The report of the Wagner Palace Car Co. for the year ending June 30, 1897, shows gross earnings, $3,436,281; expenses, $2,011,948 and net earnings, $1,424,333. This report includes the workings of the company in 20 states and the Dominion of Canada.

T. O. Rawlings & Co., 84 Louisville Trust Co. Building, Lousville, Ky., are about to build water-works at two different towns. The company wants to get into correspondence with engineers who make a specialty of water-works and electric light plants.

The entire property of the Brilliant (O.) Tube & Pipe Works, appraised at $52,500, will be sold at Steubenville, O., Aug. 9.

The Gainesville Express Refrigerator Car & Wooden Ware Mfg. Co, of Gainesville, Fla., the incorporation of which for the purpose of building refrigerator cars, was noted in this column some time ago, has elected G. W. Hyde, President; A. J. McArthur, Vice-President and S. D. Warner, Secretary and Treasurer.

Wetherill & Co., of Chester, Pa., have received an order to build eight engines for the new power-house of the Union Traction Co., at Philadelphia, Pa.

The New England Construction Co., New Haven, Conn., has been incorporated with a capital stock of $300,000 to build and equip street railroads, electric light plants, water-works, etc. The incorporators are Thomas Waller, I. A. Kelsey and S. Harrison.

The Toledo Foundry & Machine Co., Toledo, O., has received an order for a 50-ft. turntable for a 50-ton locomotive to go to Japan. It has recently shipped a steam shovel to the New Jersey & Pennsylvania Concentrating Works at Edison, N. J., for use in handling iron ore.

The Long & Alstatter Co., of Hamilton, O., has finished building a new punching and shearing machine for the Missouri Pacific shops at Baring Cross, Ark. The machine was designed especially for these shops, and has 42-in. throat capable of punching a 2-in. hole through 1¼ in. thickness 42 in. from the edge of a sheet or to the corner of an 84-in. sheet.

The trustees of the New York & Brooklyn Bridge have decided to sell eight locomotives used for switching before the adoption of electricity for that purpose. Bids will be received until 12 o'clock, noon, August 9. C. C. Martin is Chief Engineer and Superintendent, 179 Washington street, Brooklyn.

The St. Louis Car Wheel Co. on July 27 filed a chattel deed of trust with the Union Trust Co., as trustee, to secure a note for $50,000.

The Southwark Foundry & Machine Co., of Philadelphia, has received an order for four blowing engines of the vertical compound type for shipment to Russia. They will be used in connection with two blast furnaces now being built.

The Pyle National Electric Headlight Co., 1426 Monadnock Block, Chicago, Ill., has recently presented to the Correspondence School of Locomotive Engineers and Firemen, 335 Dearborn street, Chicago, one of its latest design of electric headlight. The working of the headlight will be shown to visitors to the school. The company states that orders for electric headlights have lately been received from the Texas & Pacific, the St. Louis Southwestern, the Texas Midland, the Houston, East & West Texas, the Wilmington & Northern and the Erie railroads.

The plant, patents and other property of the Conshohocken (Pa.) Tube Co. were sold by the receivers last week and bought by a committee representing 90 per cent. of the bondholders for $250,000. A meeting has been called for Aug. 11 for the purpose of reorganizing, and an application for a charter will be made.

The Newport News Shipbuilding & Dry Dock Co. is making extensive additions to its plant at Newport News, Va. One of the large additions under way is the building of an extension to the machine shop, which will be 100 ft. wide and 200 ft. long. This building will be used for finishing and erecting marine engines and other large machinery. The central portion of the building will be 50 ft. high, with an electric traveling crane of 50 tons capacity. On either side will be a gallery arranged for small machines and tools. The building is to have a steel framework throughout, and the roofs to be covered with corrugated iron. The Berlin Iron Bridge Co., of East Berlin, Conn., has the contract for furnishing and erecting the steelwork of the building.

Iron and Steel.

The St. Joseph Rolling Mill, at St. Joseph, Mo., started up last week under the management of Mr. Jones, of the Tudor Iron Works of St. Louis. New machinery has been added to the plant since it was bought from the St. Joseph Bar & Axle Co.

The puddling department of the Sharon Iron Works, at Sharon, Pa., resumed work last week and 20 furnaces are now in blast. Nearly all the finishing departments are also at work.

The New Hamilton Tin Plate Mill, near West Newton, Pa., has given an order to the Schultz Bridge & Iron Co., of McKees Rocks, Pa., for a new 100 × 130 ft. building.

On Aug. 2 a charter was granted in Pennsylvania to the Isabella Furnace Co. to make iron and steel and other metals. The incorporators are: A. E. W. Painter, Park Painter, J. Painter, Jr., John W. Chalfant and Geo. A. Chalfant, and the capital stock is $1,250,000. The new company was formed to take over three furnaces at Etna heretofore worked by the persons named under a limited partnership.

Receiver Howard Morris, of the West Superior Iron & Steel Co., West Superior, Wis., has been ordered by Judge Vinje to operate the plant of that company during the remainder of his term as Receiver. The property will be sold under foreclosure by the Central Trust Co., of New York, next December.

The Junction Iron & Steel Co., of Mingo Junction, O., and the Ætna-Standard Iron & Steel Co., of Bridgeport, O., have been consolidated under the name of the Ætna-Standard Iron & Steel Co. George Dean, Ambrose List and Captain Uquehart, of the Junction Iron & Steel Co., have been elected Directors of the Ætna-Standard Co., succeeding Joseph Bell, J. A. Topping and Alonzo Loring. The principal office will be at Bridgeport.

The King, Gilbert & Warner Co., of Columbus, O., has dismantled its Moxahala furnace, at Moxahala, O. The company has built a new stack, to be known as Steelton furnace, at South Columbus, which will be blown in shortly. This furnace will be 80 ft. × 18 ft., and equipped with three Massicks & Crookes hot blast stoves. Its annual capacity will be 120,000 gross tons of Bessemer pig.

The new plant of the Braeburn Steel Co., at Braeburn, Pa., on the line of the Allegheny Railway, about 20 miles from Pittsburgh, is about finished, and it is announced that the company will be in the market in a short time with a high-grade tool steel.

The plate mill of the Bethlehem Iron Co. has been closed for improvements.

New Stations and Shops.

Plans have been prepared by the Chicago, Milwaukee & St. Paul for a new passenger station at Cedar Rapids, Ia., to be built on Fourth street, between First and Second avenues. It will be 40 × 140 ft., part two stories high, and cost about $30,000.

The Mobile & Ohio has bought property in Mobile, Ala., for the new passenger station, plans for which were accepted some time ago, and it is expected that work will be begun at once. The company will also put in new interlocking switches and signals at Mobile.

The Mexican Central has decided to build general repair shops at Aguascalientes, Mex. It is expected that the plant with machinery will cost about $750,000, Mexican money.

The Atchison, Topeka & Santa Fe will build at once a new station at Nortonville, Kan., on the site of the present building, to be 30 × 80 ft.

The contract for the superstructure of the passenger station to be built by the Chicago, Burlington & Quincy at Omaha, Neb., has been given to John Field, of Omaha. By the terms of the contract the building is to be finished by April 15, 1898. It will be about 76 × 316 ft., and cost about $300,000. Work was begun on the new building July 26.

Interlocking.

The National Switch & Signal Co., Easton, Pa., has closed a contract through Mr. Edward C. Carter, Principal Assistant Engineer of the Chicago & Northwestern, for an interlocking plant at Earlville, Ill., at the crossing of the C. & N. W. and the Chicago, Burlington & Quincy, with 18 working levers. The contract includes electric locking for the derailing switches. Green lights will be used on the C. & N. W. for the all-clear indication at night.

The Standard Railroad Signal Co. of Arlington, N. J., has just completed an interlocking plant of 76 levers for the New York, New Haven & Hartford at Brockton, Mass.

Car Lighting.

The Mobile & Ohio Railroad has adopted the Pintsch light for lighting its passenger cars, and a plant is being erected on the railroad property at Mobile, Ala. Pipe lines will be run to the Union Station, and also to the government wharf, to supply gas to the Pintsch buoys in Mobile Bay.

Creeping of Rails.

Lieutenant-Colonel Wm. Pitt, R. E., writes to *Engineering* (London) with regard to the creeping of rails on

a railroad in the north of India with which he was once connected. On one section a great deal of trouble was had from rails creeping in opposite directions. There was a considerable range of temperature, and on one side of the track the rail crept east, and on the other side west. It was a single track with traffic in both directions, but a good deal different in amount. Colonel Pitt concluded that the difficulty was entirely from the rail fastenings. This section was laid with double-headed rails in chairs. The jaws of the chairs were tapered and the rails held by taper keys. Consequently, when the rails expanded, they could only expand toward the direction from which the keys were driven in. Any movement in the other direction would simply wedge the keys tighter. No particular trouble was caused by unequal or opposite travel of flat-footed rails. On one section where flat-footed rails were laid on a long grade the whole line traveled down hill.

Another Weed Burner.

On its lines in South Dakota the Chicago, Milwaukee & St. Paul is using a new weed burner, which is said to be very effective. The tank from an old tender is placed on a flat car and filled with crude oil, costing not over 60 cents a barrel. This oil is pumped to a receptacle and mixed with steam, making an inflammable gas. This gas is forced out under pressure from the openings in a number of pipes run along close to the roadbed and ignited. It kills everything on the roadbed and about a foot beyond the ends of the ties, the generation of steam bursting the roots of the weeds.

American Rails.

A writer in the *Ironmonger* of July 24 says: "I understand the East Indian order for 7,600 tons of rails, taken some time ago by the Maryland Steel Company, United States, has now increased by 1,250 tons. This is of peculiar interest to British rail-makers, seeing that the specifications are so rigid that there was a general impression that the American houses would not be able to comply with them. It is stated that about 70,000 tons of American rails will be exported this year, 40,000 tons going to Japan, where the rails are said to be liked better than the English rails."

The Deep Waterway Board.

A capital commission has been appointed to follow up the matter of the deep waterway from the Lakes to the Atlantic. This Board is appointed by the Secretary of War and is provided for in the Sundry Civil Appropriation bill to make a survey and examination, including estimates of cost. The personnel of the Board is as follows: Maj. Charles W. Raymond, Corps of Engineers; Alfred Noble, U. S. A., of Chicago, and George Y. Wisner, of Detroit.

The Blade Ticket Case.

The Blade Mfg. Co., Chicago, has just completed for the Louisville & Nashville ticket office, at St. Louis, a large case for both local and coupon tickets, which contain some new features. The case for tickets is mounted above a set of drawers. The rolling curtain is balanced in all positions, and when down the drawers in the lower portion of the case are locked; lifting the curtain unlocks the drawers. The case is fitted with Blade patent single tubes for local tickets, which are of tin. Each tube has a lip on the under side which engages a thin metal bar extending across the case, while the lip and bar are kept in contact by a light spring at the back of the tube. By this means the tubes are held firmly in place, yet they can quickly be removed when desired.

Ford's Electric Train Signal.

Messrs. Ford, Robertson & Co., of Great Falls, Mont., have devised an electric train signal, adapted to both freight and passenger trains, on which they have applied for a patent, and they announce that they expect to exhibit the apparatus in St. Paul, Chicago and New York next September. An electric bell, with a dry battery, is carried in the cab of the locomotive and another in the caboose at the rear of the train, and the conducting wires, of which there are three, are carried in a cable a section of which is designed to be hung beneath each car. A simple coupling has been devised for attaching the cable of one car to that of the next one, which will uncouple automatically in case of the accidental separation of the train, and in each half of the coupler, when separated, a spring acts to close the circuit so as to give an alarm both to the engine and to the caboose. When this signal is used on passenger trains a push button for signaling to the engine is connected with the wires in each car.

Overhead Bridge Warning.

On the Long Island Railroad, there stands a bridge warning at Sixty-fifth street, Brooklyn, which is a good example of design. The wire cable which is stretched across the track, is fastened near the top of one of the posts by putting it through a hole and tying a knot in it. Near the top of the other post, there is a sheave, after passing over which, the cable runs down to a turnbuckle, fastened near the foot of the post, where slack can be taken up. This turnbuckle is made of a piece of 1-in. steam pipe 20 in. long, with a hexagonal nut welded to each end. These are threaded for right and left hand screws. One end of the turn-buckle is fastened to a bracket which is attached to the post. The method of attaching the straps, or pendants, so that they will not wear off nor get caught around the cable, consists in bending the end of a short piece of ¼-in. wire loosely around the cable, so as to allow it to swing freely. The lower end of this wire is bent at right angles to the rest for the purpose of attaching a piece of rope, which forms the strap proper. To do this the strands of the rope are separated a few inches from the end, and the bent end of the wire, which is just long enough to extend through the rope, is inserted in the opening thus made. The short end of the rope is then laid against the wire above the turn, and served with stout cord. A piece of wire, about No. 8, is twisted tightly around the cable, on each side of the pendant, to keep it from sliding sidewise out of place, and so leave an opening in the guard. We are indebted to Mr. James F. Hobart for this description.

Pig-Iron Production.

According to statistics of the American Iron & Steel Association in the *Iron Age* the total production of pig iron in the United States in the first half of 1897 was 4,403,476 gross tons, against 4,976,236 tons in the first half of 1896 and 3,646,891 tons in the second half of 1896. As compared with the first half of 1896 there was a decrease of 572,760 tons, but as compared with the second half of 1896 there was an increase of 756,585 tons. Pennsylvania leads with 2,149,252 gross tons for the first half of 1897, against 2,246,753 tons for the same period of last year, a decrease of 97,501 tons, and against 1,777,413 for the second half of 1896, an increase of 371,839 tons. Ohio comes next with 593,962 gross tons for the first half of this year, against 743,444 tons for the corresponding period of 1896, a decrease of 149,482 tons, and against 452,882 gross tons for the second half of last year, an increase of 141,080 gross tons.

The figures in the *Iron Age*, however, do not agree. For instance, in adding the totals of the table giving the production of charcoal pig iron with those of the table of coke and anthracite pig-iron production the grand total will not agree with the totals of the entire production.

The production of Bessemer pig iron in the first half of 1897 was 2,495,978 gross tons against 2,793,672 tons in the first half of 1896, and 1,861,283 tons in the second half. Of the total increase of 756,585 tons of all kinds of pig iron in the first half of 1897 over the last half of 1896, 634,695 tons, or almost six-sevenths, was of Bessemer quality.

The production of basic pig iron for the first half of 1897 was 281,610 gross tons, against 191,687 tons for the first half of 1896, and 144,716 tons for the second half of the same year.

The stocks of unsold pig iron on hand June 30 amounted to 827,163 gross tons, against 711,649 tons on Dec. 31 last, an increase of 115,514 tons.

Electric Machinery for Central America.

Consul Morlan, at Belize, British Honduras, C. A., reports that the municipal board of Belize is contemplating the building of an electric lighting plant for the streets and public buildings of that city, and he believes there is an opening for an American plant, if tenders are made in competition with English companies. A telegraph line of about 200 miles is also to be erected, and a telephone line will probably be used in connection with it. An American machine for the manufacture of ice has been contracted for and will shortly be working.

Shipments of Southern Iron.

Complete reports on the movement of Southern iron, compiled by the Southern Iron Committee, for the first six months of the present year, show that during that period 528,893 tons of pig iron and iron pipe were shipped from Alabama and the Chattanooga District in Tennessee, of which 491,003 tons were pig and 37,890 tons pipe. Of this the Birmingham District alone forwarded 353,406 tons. The total increase is nearly 100,000 tons, as compared with the corresponding period of last year. The most remarkable increase was in export shipments to Europe, which amounted to 120,708 tons, as compared with about 15,000 tons during the same period of last year, this increase being about 900 per cent. The export shipments for the entire year promise to be at least 300,000 tons, or three times those of last year, the bulk of last year's export trade having been during the last half of the year.

THE SCRAP HEAP.

Notes.

Reports come from Middletown, Conn., and Butler, Pa., of the bursting of a dam at each place, as a result of the recent heavy rains.

The new fast mail train of the Atchison, Topeka & Santa Fe, leaving Chicago early in the morning, now runs through to Kansas City in 11½ hours.

The roundhouse of the Western of Alabama, at Montgomery, was burned on Aug. 1, together with the adjoining shop. Sixteen locomotives were in the roundhouse.

Ohio papers report that the passenger conductors of the Pennsylvania Lines now wear uniforms decorated with service stripes, a silver bar on the left arm indicating five years' service, two bars ten years, etc.

The new train of the Atlantic City road, scheduled to run from Camden, N. J., to Atlantic City, 55½ miles, at 64 miles an hour, is reported to have reached its destination on time every day during the month of July; and on some days additional cars had to be used.

The Attorney-General of Texas has filed 19 suits against railroads to recover a five thousand dollar penalty in each case for unlawful discrimination in charges on cotton transported in 1896. The suits are based on the long and short haul law. It is said that about 800 suits of this kind will be instituted.

The officers of the Chicago, St. Paul, Minneapolis & Omaha, in conjunction with United States Marshals, have been making a determined war on the tramps in the vicinity of Omaha, who had become so bold that they stopped freight trains frequently. Large numbers were arrested. Of 21 taken before the United States Court, 19 were imprisoned for terms varying from 3 to 15 days, for obstructing the mails.

The Railroad Commissioners of Kentucky have issued to the railroads a circular calling attention to various provisions of the law which, it is stated, are not well enough obeyed. The circular refers to the regulations for opening ticket offices, for announcing delays of passenger trains, for ringing locomotive bells, for maintaining crossing signs, for reporting accidents, for filing tariffs, for making annual reports, etc.

The North Carolina Railroad Commission has exactly doubled the assessed valuation, for the purposes of taxation, of the property of the Western Union Telegraph Co. in that state, and has ordered that, beginning Sept. 1, that company shall collect not over 15 cents on messages of 10 words or less within the state. Telegraph companies other than the Western Union, including the Postal, are allowed to charge 20 cts. for the same service. When a message is handled by two or more companies the rate shall not exceed 30 cts. (30 and 1) over both lines.

The strike of the coal miners continues unsettled, the newspapers reporting various changes in the state of the negotiations from day to day. There have been some disturbances. At Belleville, Ill., last week, a band of strikers tried to capture a freight train of the Illinois Central. On Saturday a bridge of the Wheeling & Lake Erie, near Wheeling, was burned, and the act was attributed to the strikers. President Dolan, while leading a gang of marching strikers at Pittsburgh, was arrested for inciting riot. Some accessions to the ranks of the strikers are reported in West Virginia, but no very serious distress for lack of coal is reported from any point. There is great activity in the coal mines of Alabama. The Southern Railway has purchased a number of barges, and will establish its own line for carrying coal from its western terminus at Greenville, Miss., to New Orleans.

Coal Contracts.

Buffalo papers report that the New York Central has bought 400,000 tons of bituminous coal, to be delivered at Buffalo and Rochester during the coming year, at $1.20 and $1.25 a ton, the lowest prices ever recorded. The contract is divided between the Rochester & Pittsburgh Company, the Fairmont Coal & Coke Company and Osborn, Sager & Co., of Cleveland.

Mail Tubes in New York.

The work of laying the tubes for the transmission of mail in this city was begun by the Tubular Dispatch Co. on Monday. The first tubes to be laid will be between the General Post Office and the sub-station at the Produce Exchange. The plans contemplate a double line of tubes from the post office in this city to the one in Brooklyn, together with a line to the sub-station at Forty-fourth street and Lexington avenue and several side lines to other subs-tations.

Railroad Taxes.

The Board of Public Works of Virginia has completed the assessment of railroad and canal property for the present year. The length of railroad in the state, including 164 miles of street railroads, is 3,560 miles, an increase of 69 miles. The total valuation is $53,789,022. The state assesses taxes on this amount a four tenths of one per cent., making $215,156, and it also receives a tax of one per cent. on net income.

The Railroad Commissioners of North Carolina have reported their valuations for taxation for the current year, and have largely increased the rates on the principal roads. On the Petersburg road, for example, the rate per mile is increased from $10,000 to $13,000; on the Norfolk & Carolina, from $10,000 to $12,000; on the Atlanta & Charlotte, from $10,000 to $12,000; on the Georgia, Carolina & Northern, from $9,000 to $9,500; on the Raleigh & Gaston, from $10,000 to $11,500. The total increase over last year is $2,882,000. The valuation of the property of the Western Union Telegraph Co. is doubled.

The Metric System.

Ex-Governor Stone of Pennsylvania, now Chairman of the House Committee on Coinage, will try at the next session of Congress to put through a bill for the adoption of the metric system of weights and measures. This bill will differ somewhat from that which failed in the last Congress. The first section provides that from July 1, 1898, the metric system shall be used exclusively in all government transactions, except in finishing the survey of the public lands. The second section provides that after Jan. 1, 1901, the metric system shall be the only legal system recognized in the United States. This, of course, does not prevent anybody using any system that he chooses, but it establishes the metric system as the legal standard.

Twin and Triple Screw Propellers.

On the basis of an analysis of the relative efficiencies, as propellers, of single and twin screws submitted to the institution of Naval Architects nearly 20 years ago, *Cassier's Magazine* states that a prediction was ventured that as speeds increased in passenger steamers it would be found advantageous to adopt twin screws, not merely for increased safety, but for economical propulsion. It is well known that the result anticipated has occurred. Twin screws are now adopted, not merely in swift passenger steamers, but in the largest cargo steamers of moderate speed. At the present time, a large number of warships built and building are fitted with triple screws. Very few trustworthy details are yet available as to the relative performances of triple and twin screws. So far as maximum powers and speeds are concerned, triple screws have not proved advantageous, judging from published figures for powers and speeds of ships which can be fairly compared with one another. Other advantages are claimed for triple screws—such as greater safety, or greater economy at low speeds. There is no doubt some increase of safety, but large experience with twin screw ships seems to show that they have an ample margin of safety. As to economy at low speeds, data from actual

trials are not available. Trials appear to have been made, but the figures have not been published. In the royal navy, up to the present time, it has been preferred to adhere to twin screws as giving, on the whole, greater advantages under existing conditions. With the limits of draft available, high efficiency has been secured in cruisers developing 20,000 to 25,000 H. P. In the mercantile marine, similar results have been obtained with twin screws. In vessels of small size and draft in relation to their speeds, such as destroyers and torpedo gunboats, twin screws have also done so well up to date that their designers have hesitated to adopt triple screws, although alternative plans have been prepared.

Electric Road Mail Service in Maine.

The Rockland, Thomaston & Camden Street Railway is the first electric road in Maine to run a mail car. A separate compartment has been fitted up in a car expressly for this service, and mails are now collected and distributed along the line of the road. The car is 28 ft. long over all, and is equipped with a Taylor single truck with a 6 ft. 6-in. wheelbase, 33-in. wheels and two G. E. 1,000-H. P. motors. The company has just completed a ¾-mile extension on the Highlands branch, which now runs to the corner of Lime Rock street on the Old county road.

Lake Notes.

The steamer Crescent City, of the Zenith Transportation Co., has broken all records out of Chicago by carrying 225,000 bu. of corn, or 6,300 tons, beating the highest previous record from the upper lakes by 166 tons, and this previous record was made by a barge that had no engines, boilers nor fuel to carry.

The Chicago & Northwestern road is carrying daily 400 carloads of iron ore to Ashland from the Gogebic Range, and 150 to Escanaba. It is also carrying some 700 cars to Escanaba from the mines about Iron Mountain, Menominee Range. On Saturday and Saturday night last the Duluth & Iron Range delivered 1,600 cars of ore at its docks at Two Harbors, near Duluth. The company has handled about 950,000 gross tons of ore since June 1st.

Because of the greater depth in the connecting channels of the lakes this year, steamers that were two years ago able to carry but about 2,000 tons, are now carrying 3,000 tons, and the added cost for wages and fuel is almost nothing.

An incident that occurred in the harbor of Duluth last week may perhaps explain the loss of two new steel ships with all on board three years ago. The Rockefeller barge John Scott Russell had loaded and was going into the lake when it was found that she was making water. It was necessary to run her aground and let her sink, so fast did the water come in. Examination showed that the heads of many rivets had been cut off by the working of the ship in a sea when running up to Duluth light. This may have caused the loss of the Western Reserve and Gilcher three years ago.

Railroad Supplies for Japan.

A late British consular report says: "British manufacturers had practically a monopoly in supplying rails, engines, rolling stock, etc., but recently there has been a tendency to obtain them from other countries. With the prospect of increased tariffs in the United States, it is not improbable that the Japanese orders may again be placed in Great Britain. All requisitions are issued from the chief railroad office in Tokio under stringent regulations, which reduce competition within very narrow limits. The Japanese experience of American engines has not been favorable and so they prefer to use British make; but owing to British makers finding it difficultto adhere to a special date for delivery, orders are now going to America. The government seems to find the system of importing the material and setting it up in Japan a satisfactory one, and considerably cheaper than importing the complete engine."

Machinery for Sydney, N. S. W.

Yesterday tenders amounting to about £54,000 were accepted by the Department of Public Works. Included in this very large sum is the Manly sewerage contract of Messrs. R. & S. Butcher for £13,628; but the item which swells the total to such a big amount is the acceptance of a contact for £38,119 for the steam engine and electric generators for the George street electric tramway. The tender accepted is that of Messrs. H. H. Kingsbury & Co., agents for the Thomson-Houston International Electric Co. of New York. The power-house is to be established at Darling Harbor, and the plant will be capable of supplying the electricity required to run a large portion of the present steam tram system when the conversion takes place in addition to the George street line. In accordance with a promise made to the House by the Premier, this will not be made till the George street tramway has been proved to be a success. Unfortunately, this will take at least another year or even 18 months, for the shortest time of delivery of the steam engine and generators, at a reasonable price, is 46 weeks, or nearly a year. A minute drawn up by the Under Secretary for Works, Mr. Hickson, shows that no less that 38 tenders were sent in by seven different firms, the successful tenderers, Messrs. H. H. Kingsbury & Co., sending in no less than 30, and the Brush Engineering Company three. These all varied in accordance with the time allowed for carrying out the contract. As the machinery will, when the tramway is constructed, be under the charge of the Railway Commissioners, Mr. Deane (the Engineer-in-Chief for Railway Construction), with the concurrence of the Railway Commissioners, conferred with Mr. Thow and Mr. Elwell in regard to the tenders, and as a result a joint report was submitted. After searching investigation of the tenders from a mechanical and financial point of view and also in regard to the time for delivery, it was decided to recommend the acceptance of the tender of Messrs. H. H. Kingsbury & Co., delivery to be made within 46 weeks.—*Sydney Herald.*

Iron and Steel Exports.

Figures of the Bureau of Statistics of the Treasury Department show that the total exports of pig iron by the United States during the first five months of 1897 amounted to 107,971 gross tons. For the same period the exports of steel rails were 39,319 gross tons, of steel ingots, bars, rods, etc., 30,654 gross tons, and wire, 21,536 gross tons.

LOCOMOTIVE BUILDING.

The Oregon Short Line is reported in the market for two locomotives.

The report that the Cleveland, Cincinnati, Chicago & St. Louis will shortly place orders for new engines is denied.

The Baldwin Locomotive Works deny the report that they have received an order to build three more engines for a railroad in China.

The Baldwin Locomotive Works has received an order to build two locomotives for the National Interoceanic Railway of the Isthmus of Tehauntepec. They will be American type, with 17 × 24 in. cylinders, and weigh, in working order, about 64,000 lbs.

In our last issue we noted an order of the Chicago, Milwaukee & St. Paul Ry. to the Baldwin Locomotive Works for two passenger and four freight engines. The passenger engines will be Vauclain compounds of the Atlantic type with cylinders 13 in. and 22 in. × 26 in., driving wheels 78 in., total weight 142,000 lbs. and are similar to the one described in the *Railroad Gazette*, July 24, 1896. The freight engines will be 10-wheel Vauclain compounds, with cylinders 12½ in. and 21 in. × 26 in. driving wheels 62 in., total weight 125,500 lbs. The Chicago, Milwaukee & St. Paul has been using this type of freight engine for several years, and the new engine will be the same as those now in service.

The Chicago & Northwestern has placed an order with the Schenectady Locomotive Works for 10 ten-wheel freight locomotives. They will have the following general dimensions: Cylinders, 19 × 26 in.; diameter of drivers, 63 in.; weight on drivers, 116,000 lbs.; total weight in working order, 153 000 lbs.; radial stay extended wagon top boiler; barrel 64 in. in diameter at front sheet; steam pressure, 190 lbs. per square inch; driving wheel base, 14 ft. 10 in; total wheel base, 25 ft. 10 in. The driving wheel centers, foot plates, extension pads, frame filling pieces, guide yoke brackets, together with a number of small castings will be of steel. The driving wheel centers will be furnished by the American Steel Casting Co., and the truck and tender wheels will be the McKee-Fuller and Standard Steel Works pattern, with wrought-iron centers. The Nathan Manufacturing Co. will furnish the lubricators and injectors, the American Brake Co. the driver brake equipment, and the Westinghouse Air Brake Co. the tender brake equipment, air pump and governor. Golmar bell ringers, Chicago couplers, Ashton safety valves, Dean sanding devices and Crysler metallic packing will be used.

CAR BUILDING.

It is stated that the Illinois Central is asking bids on 200 box cars.

The Missouri Pacific has ordered 500 box cars from the Missouri Car & Foundry Co.

The Mount Vernon Car Mfg. Co. has received an order to build 250 box cars for the Georgia Railway.

The report published by a contemporary that the St. Paul & Duluth is likely to order new cars is denied by the road.

We are advised by the Armour Car Lines that the recent published report that it will shortly buy new refrigerator cars is not correct.

The Erie Car Works, of Erie, Pa., is building two combination box and tank cars for the Golden Gate Oil Co., of San Francisco, and 10 flat cars for the Mt. Jewett, Kinzer & Riterville Railroad.

The Ohio Falls Car Mfg. Co., of Jeffersonville, Ind., has received an order to built 100 flat cars for the Mobile, Jackson & Kansas City Railroad. These will be equipped with Tower couplers and New York air-brakes and the other parts will be standards of the Ohio Falls Car Mfg. Co.

The Chicago, Rock Island & Pacific has placed an order with the Michigan-Peninsular Car Co. for 200 box cars, 60,000 lbs. capacity. They will be 34 ft. long and equipped with Westinghouse air-brakes, Bettendorf brakebeams, Janney couplers, Dunham doors and Winslow roofs.

The Southern Pacific is building six vestibuled baggage and express cars and 30 double hopper bottom coal cars of 30 tons' capacity at its Sacramento shops. General Manager Kruttschnitt is reported as stating that the company has decided to put vestibules on all of its main line passenger equipment.

The Jackson & Sharp Co., of Wilmington, Del., has received an order to build 22 cars for the London Central Underground Electric Railroad. They will be built on the style of the cars of the Manhattan Elevated Railroad in New York, except that they will have arched roofs and slanting sides. The first shipment of the new cars will be made in September.

The Titusville Electric Traction Co., of Titusville, Pa., has placed an order with the American Car Co., of St. Louis, for four passenger cars. They will be equipped with Peckham trucks and Westinghouse motors.

The Newburyport Car Mfg. Co., of Newburyport, Mass., has recently built four new open cars for the Plum Island electric road. The company has also built 35 new cars for the West End road of Boston and two open and two closed cars for the new Arlington & Winchester electric road.

BRIDGE BUILDING.

Agosta, O.—The contract for the iron bridge over Scioto River has been given to the Canton Bridge Co. for $3,900.

Baltimore, Md.—The contract for a steel bridge and approaches over Gwynns Falls, on Wilkens avenue, has been given to the Structural Iron Co., Baltimore, for $24,489.

Boston, Mass.—On July 30, bids for the new Longwood avenue stone arch bridge that will connect this city and Brookline were opened. Brookline and Boston are to share the cost, and $170,000 has been appropriated for the structure. Twenty proposals, ranging from $115,000 to $171,769, were received. Messrs. Woodbury & Leighton, Boston, were the lowest bidders. The contract will be awarded soon.

Cincinnati, O.—A project looking to the building of a viaduct in the West End is now in the hands of City Engineer Stanley. The improvement contemplates a viaduct 1,800 ft. long and 60 ft. wide, running alongside Harrison avenue and spanning Mill Creek and the tracks of the C., H. & D., Big Four and B. & O. S. W. railroads. It is designed to have one approach on Western avenue and another on Ernst street.

Herkimer, N. Y.—The Town Board and Commissioner of Highways let the contract for an iron bridge, span 206 ft., width 18 ft., across the west branch of the West Canada Creek on July 28 to the Canton (O.), Bridge Co. for $5,360.

Langdon, N. Dak.—Reports state that bids are asked by the County Commissioners until Aug. 16 for a 100-ft. wood and iron bridge across the Pembina River at Langie Crossing. Robert Work, County Auditor.

Lindsay, Ont.—Bids are asked Aug. 13 for a steel bridge and approaches over Pigeon Creek. T. Matchett, County Clerk.

Louisville, Ky.—It is said that the Board of Public Works has decided to build a stone and iron bridge over Beargrass Creek, at an estimated cost of $9,000.

Monroe, La.—It is reported that the contract for the steel highway bridge across the Ouachita River has been given to the Milwaukee Bridge & Iron Works for $49,933.

Mount Morris, N. Y.—Bids were received July 27 for building a bridge across the Genesee River between this place and Leicester, as follows: James Fox, Oramel, N. Y., $24,900; Groton Bridge Mfg. Co., $25,137; Owego Bridge Co., $24,500.

Owen Sound, Ont.—Tenders are being received by R. McDowall, Engineer in charge, for a steel bridge at Hanover, with span of 72 ft., roadway 18 ft. clear, also for the construction of four iron pile abutments; estimated length, 25 ft.

Peterborough, Ont.—Tenders are invited for a swing bridge crossing the Trent Canal at Rosedale. L. K. Jones is interested.

Philadelphia, Pa.—On July 26, Director of Public Works T. M. Thompson awarded the contract for the masonry work, substructure, abutments and retaining walls for a swing bridge over the Schuylkill at Gray's Ferry, to Jutte, Foley & Co., of Pittsburgh, for $235,000.

Port Kennedy, Pa.—The Philadelphia & Reading is contemplating an overhead bridge at the crossing at the station here, thus doing away with the grade crossing.

Richmond, Va.—It is said that plans for a railroad from Lorraine, across the James River, and along the bank to the tidewater below Manchester, will shortly be put into execution. The plans include a bridge at Lorraine, a point about 12 miles above Richmond, designed to accommodate teams and foot passengers as well as the railroad. Mr. Ware B. Gay is interested in the project.

Watertown, N. Y.—The contract for the Mill street bridge across the Black River has been given to the Groton Bridge Mfg. Co. for $9,600.

Woodbury, Pa.—The special committee appointed by the Board of Freeholders to examine the bridge across the creek in this city has decided to advertise for bids for the extension of the wing walls, to be of such material as shall be recommended by Surveyor Carter.

Worcester, Mass.—The contract for the masonry bridge, in place of a portion of the causeway at Lake Quinsigamond, was awarded July 30 to the Webb Granite & Construction Co., for $64,500. It is probable that only the foundations will be put in this season. The other bids were: J. W. Bishop & Co., $68.114; Norcross Bros., $75,000; Cutting, Bardwell & Co., 133,900.

Youngstown, O.—Bids are asked Aug. 18 for the superstructure of the bridge over the Mahoning River at Market street. The structure will be 1,850 ft. long and 54 ft. wide. Bids are asked Aug. 17 for the substructure for the same. D. M. Wise, City Engineer.

RAILROAD LAW—RECENT DECISIONS.

Where a railroad company, in order to obtain shipments from one whose place of business is so situated that no cartage is required when he ships by another road, makes him a rebate to cover the cost of cartage, but makes no such rebate to shippers who require cartage by whichever road they may ship, it is guilty of such discrimination as is declared unlawful by the Interstate Commerce Act decided in the United States Supreme Court, May 24, 1897).[1]

The Interstate Commerce Commission may pass upon the question whether an existing rate charged by a railroad company affected by the provisions of the Interstate Commerce Act, for the carriage of freight or passengers, is reasonable, but it has no power to fix rates itself. It was not the intention of Congress to invest the Commission with any power to legislate (decided in the United States Supreme Court, May 24, 1897).[2]

The President, Vice-President, Secretary, Treasurer and General Manager of a railroad corporation, selected by it through its Board of Directors, are general officers, and may make any contract for the corporation which can lawfully be made by it. In an action to recover the value of medical services rendered to the employees of a railroad company, on the employment of such officers, it was contended that only the Board of Directors had power to make such contract for the company. It is held that the contract in question was valid and binding upon the corporation (decided by the Indiana Court of Appeals, April 30, 1897).[3]

Where a railroad company has condemned for its right of way a strip extending through a tract of land belonging to its grantor, and has procured a reduction of damages by agreeing to construct a crossing over the said strip, and has maintained such a crossing ever since the land was conveyed to it; it must continue to maintain the crossing, and cannot claim that either its grantor or his subsequent grantees are not entitled to the use thereof (decided by the Supreme Court of Rhode Island).[4]

By an act amending the charter of the Baltimore City Passenger Railway Company, the Legislature authorized it to use any system of propulsion which the Mayor and City Council might authorize other corporations within the city to use. A subsequent act gave other companies in the city the right to use the trolley system. It is held that by these acts power was granted to the said railroad company to adopt a trolley system and to erect poles for that purpose, and that the Mayor and City Council could not refuse to issue a permit to place the poles by virtue of an act giving the said Mayor and Council power to require all wires to be placed underground, when the Council had taken no action under such act as to trolley wires (decided by the Maryland Court of Appeals, April 1, 1897).[5]

Where a street railroad company has constructed its line on the public road, it is liable to an abutting owner for any consequent depreciation of the value of his premises (decided by the Pennsylvania Supreme Court, May 3, 1897).[6]

A non-resident alien is not entitled to the benefit of the Pennsylvania statute giving a right of action to members of the family of one whose death is caused by a wrongful act (decided by the Pennsylvania Supreme Court, May 27, 1897).[7]

A verdict for $400, rendered against a railroad company for carrying a young and inexperienced girl, traveling alone, past her destination and past the station at the next town, so that she had to walk back half a mile to said town, carrying a valise weighing 25 lbs., and then leaving the valise, walk half a mile or more to the residence of relatives, will not be set aside as excessive, though it was daylight and she was well acquainted with the vicinity and had a brother living there (decided by the Indiana Court of Appeals, May 26, 1897).[8]

One about to drive over a railroad crossing must stop as well as look and listen. To moderate the pace of his team on approaching the crossing is not a sufficient compliance with the rule (decided by the Pennsylvania Supreme Court May 27, 1897).[9]

The rule in many states, on the contrary, is that one is not obliged, as a matter of law, to stop, and that it is for the jury to say whether under the circumstances of the particular case a failure to do so was negligent. It is so held in Massachusetts, New York, Vermont and other states.[10, 11, 12]

A street railroad, the right of which to cross a standard railroad has been determined, has the right, when the old crossing wears out, to put in a more modern one, which is an improvement (decided by the Indiana Supreme Court April 30, 1897).[13]

A husband may recover damages for the loss of the society and assistance of his wife caused by injuries to her through the negligence of defendant, although the wife has already recovered in her own right for the injuries received (decided in the Massachusetts Supreme Court, May 19, 1897.)[14]

A public highway was so constructed that it terminated at right angles with and 20 ft. distant from an unfenced and unguarded railroad cut. It is held that the railroad company is not liable for the damage sustained by one who, being ignorant of the locality, and in the dark, drove on from the end of the highway over the intervening land into the cut (decided by New Jersey Court of Appeals, March 1, 1897).[15]

The doctrine that an unguarded excavation on land outside a public highway, but so near as to make it unsafe for a traveler exercising ordinary care, will render the owner liable for any damage sustained, if the traveler falls into it, is recognized in New York,[16] New Jersey[17] and other states. This case is decided on the ground that the proximity of the cut was not such as to bring it within the rule.

In an action by an administrator to recover damages for causing the death of his intestate it appeared that the deceased was run over by an electric car through such negligence on his part as would bar a recovery. The car, after running over him, backed and ran over him again. It is held that the street car company was not responsible for any error of judgment of the motorman in managing the car after it first struck the deceased (decided by the New York Court of Appeals, May 4, 1897).[18]

In the absence of an express and special contract extending its liability to losses on connecting lines, a carrier accepting goods directed to a point off its line, is only bound to carry them safely over its own route and to deliver them safely to the next connecting carrier, and a local station agent cannot extend the liabilities of his company beyond its own line without authority expressely conferred upon him for that purpose, or unless it has been held out in some manner by the company that he has such authority (decided by the Maryland Court of Appeals, March 31, 1897).[19]

It is not, as a matter of law, negligence for one to attempt to cross a railroad, when the view and sound of an approaching train are obscured by smoke and dust and by the noise of a train which has just passed. Whether it is such negligence as will defeat a recovery, depends on the facts of the particular case, and must be submitted to the jury to decide (decided by the Illinois Supreme Court, May 11, 1897).[20]

If horses break out of their owner's pasture and stray upon a railroad track without fault on the part of the railroad company and there are killed through the negligence of the company's employees, the negligence of the owner in permitting the horses to stray will bar him from recovering damages for their loss (decided by the New Jersey Court of Appeals), March 1, 1897. [21]

[1] Wight vs. The United States, 17 Sup. Ct. Rep., 822.
[2] Interstate C. Com. vs. N. O. & T. P., 17 Sup Ct. Rep., 896.
[3] Bedford Belt vs. McDonald, 46 N. E. Rep., 1,022.
[4] Rathbun vs. N. Y., N. H., & H., 37 Atl. Rep., 300.
[5] Hooper Mayor et al. v. B. C. Pass. Ry. 37 Atl. Rep., 359.
[6] Thompson v. Citizens' T. Co. 37 Atl. Rep., 205.
[7] Deni v. Rennsylvania, 37 Atl. Rep., 558.
[8] L., N. A. & C. v. Rinicker, 47 N. E. Rep., 239.
[9] Decker v. L. V., 37 Atl Rep., 570.
[10] Manly v. D. & H. C., 37 Atl. Rep., 279.
[11] Tyler v. N. Y. & N. E., 137 Mass., 238.
[12] Kellogg v. N. Y. C. & H. R., 74 N. Y., 72.
[13] Chicago & C. T. v. Hammond and others, 46 N. E. Rep., 999.
[14] Kelley vs. N. Y., N. H. & H., 46 N. E., Rep., 1063.
[15] Daneck vs. Pennsylvania, 37 Atl. Rep., 59.
[16] Beck vs. Carter, 68 N. Y., 283.
[17] Vanderbeck vs. Hendry, 34 N. J. Law, 467.
[18] Rittner vs. Crosstown, 46 N. E. Rep., 1044.
[19] Hoffman et al vs. C. V., 37 Atl., Rep., 214.
[20] C. & N. W., vs. Hanson, 46 M. E. Rep., 1071.
[21] Case vs. C. of N. J., 37 Atl., Rep., 65.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Kansas City, St. Louis & Chicago, quarterly, preferred, 1½ per cent., payable Aug. 2.

Louisiana & Missouri River, preferred, 3½ per cent., payable Aug. 2.

Pulman's Palace Car Co., quarterly, $2 per share, payable Aug. 16.

St. Paul & Duluth, preferred, 2½ per cent., payable Sept. 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Chicago, Milwaukee & St. Paul, for the election of directors, Milwaukee, Sept. 18.

Wabash, annual, for the election of directors, St. Louis, Sept. 14.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Society of Railroad Superintendents* will hold its next meeting at Nashville, Tenn., beginning Sept. 22.

The *American Street Railway Association* will hold its sixteenth annual convention in Convention Hall, Niagara Falls, Oct. 19-22. 1897.

The *Association of Railway Superintendents of Bridges and Buildings* will hold its seventh annual convention at the Brown Palace Hotel, Denver, Col., beginning Oct. 19, 1897.

The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' and Architects' Association of Southern California* meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday each month at 8 p. m.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 25 East Eighth street, Cincinnati, O., on the third Thursday in each month, at 7:30 p. m. Address P. O. Box 333.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Society of Western Pennsylvania* meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Master Car and Locomotive Painters' Association* will hold its annual convention at Old Point Comfort, Va., Sept. 8, 1897. Robert McKeon, Secretary, Kent, O.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *New England Roadmasters' Association* will hold its adnual convention at the Revere House, Boston, Mass., Aug. 18 and 19, 1897.

The *North-West Railway Club* meets on the first Tuesday after the second Monday in each month, at 8 p. m., the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *Railway Signalling Club* will meet on the second Tuesday of the months of January, March, May, September and November, in Chicago.

The *Road Masters' Association of America* will hold its annual meeting at Old Point Comfort, Va., Sept. 14-16, 1897.

The *St. Louis Railway Club* holds its regular meeting on the second Friday of each month, at 3 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. A. Sorge, Jr., 1533 Marquette Building Chicago, is secretary.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *Western Society of Engineers* meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736-1739 Monadnock Block, Chicago.

Northwestern Electrical Association.

The fifth semi-annual convention of the Northwestern Electrical Association was held in the City Hall at La Crosse, Wis., July 21 and 22. The papers read and discussed at this meeting were: "The Utility of Exhaust Steam," by George L. Thayer; "220-Volt Lamps," by Prof. George D. Shepardson, of the University of Minnesota; "The Constant Potential Arc," by Messrs. O. M. Rau and F. A. Vaughn, and "The Meters of To-Day," by R. F. Schuchardt.

Eastern Railroad Commissioners' Club.

This name has been given to the association of state railroad commissioners, which met at Portland, Me., on Tuesday of last week on the invitation of the Commissioners of Maine. The organization appears to be wholly informal, no programme for discussions having been made out, and a considerable portion of the time allotted for the meeting being spent in excursions. There were 20 men present, and the club chose the following officers: President, B. F. Chadbourne, Maine; Vice-President, H. M. Putney, New Hampshire; Secretary, W. O. Seymour, Connecticut; Treasurer, Z. S. Stanton, Vermont; Executive Committee, B. F. Chadbourne, F. M. Baker, of New York, E. L. Freeman, of Rhode Island. Authority was given the committee to call the next meeting, and invite any person they deem best to attend.

Traveling Engineers' Association.

A committee of the Traveling Engineers' Association, which meets at the Beach Hotel, Chicago, Ill., Sept. 14, submits the following questions on the subject "The injector, the difficulties met with in its operation and best remedies for the trouble." 1. What has been your observation as to the different causes when the injector will not prime? 2. When the injector primes, but will not force water into the boiler, what generally is the trouble? 3. Will the injector continue to work and deliver the water out of the overflow instead of into the boiler if the check valve on the boiler sticks or fails to work properly? 4. When the injector becomes choked with lime, or other substance, and refuses to work, what is the general practice on your line in removing same? 5. Are the injectors in use on your line provided with their own independently acting water valves between injectors and tank hose; if not, what trouble have you experienced therefrom? Answers to the above and any other information on the subject should be sent to J. W. Hall, Chairman, Commerce, Tex.

National Association of Railway Agents.

This Association will hold its first annual convention at the Hollenden Hotel, Cleveland, O., Aug. 17, 18 and 19. Among the subjects to be discussed are the following: "The Relations Between Local and Commercial Agents from a Social and Traffic Standpoint"; "Legitimate Use of Tracers"; "Have Local Freight Agents the Right to Allow the Inspection of Goods Billed to Shipper's Order without Surrender of Original Bill of Lading?" "Use and Misuse of Abbreviations in Waybilling;" "Seniority in Making Promotions," and "Duties of an Agent to the Public."

The National Association of Railway Agents was organized at Youngstown, O., in February, 1897. Three or four years ago the station agents had an association which came to an untimely end through mismanagement. The organization of to-day includes many of the members of the old organization. Agents, cashiers, commercial and traveling freight agents and traveling auditors are the classes eligible to membership. The present officers are:

President—O. J. Hammon (P. S. & L. E.), Pittsburgh, Pa.
Vice-President—C. A. Witzel (C. T. & V.), Cleveland, O.
Secretary—James Aiken (P. & W.), Youngstown, O.
Treasurer—A. N. Dietz (C. T. & V.), Cleveland, O.

American Institute of Electrical Engineers.

The fourteeth general meeting of the American Institute of Electrical Engineers was held at Greenacre-on-the-Piscataqua, Eliot, Me., July 26, 27 and 28. A feature of the meeting was the exhibit of the experimental apparatus of the late Prof. Moses G. Farmer, whose first electrical undertaking, a short electric exhibition road, was put in operation at Dover, N. H., 50 years ago. Professor Farmer's daughter, Miss Sarah J. Farmer, permitted the exhibition of a large number of his models and experimental apparatus, and the Smithsonian Institution loaned for the purpose the motor and car which Professor Farmer exhibited at Dover.

A list of the papers which were read at this meeting was given in this column in our issue of July 23. The paper presented by Mr. Horatio A. Foster, on "The Cost of Steam Power," embodied the results of an extended investigation covering widely different types of industry and conditions of operation. Twenty two plants, varying from 12 H. P. up to 2,422 H. P. capacity, were investigated and the results tabulated and discussed, it being found that the variations of cost shown are so great as to make it almost impossible to generalize. In the case of large compound condensing engines the cost was found to be $.00824 per horse-power hour. The average of other investigators of repute is $.00705. The paper contained much valuable data on the cost of steam power and on what should be included in such an estimate.

The next general meeting of the Institute will be held at Omaha, Neb., at the time of the Trans-Mississippi Exposition at that place.

Society for the Promotion of Engineering Education.

This society will hold its fifth annual meeting at Toronto, Ontario, Aug. 16, 17 and 18 at the School of Practical Science, College avenue. There will be five sessions to be held Monday morning and evening, Tuesday morning and evening, and Wednesday morning. The program has been arranged so that the afternoons of Monday and Tuesday shall be available for excursions. Arrangements have been made for reduced rates to those attending the meeting of the British Association for the Advancement of Science, at Toronto, which immediately follows this meeting. These rates are, however, available only to member of the B. A. A. S. Members of the American Association for the Advancement of Science are entitled, by the resolution of the Association (Liverpool meeting, 1896) to be enrolled as members of the Association for the year 1897, on the payment of $5 to the local Treasurers at Toronto, James Bain, Jr., or Prof. R. Ramsay Wright. The number of members of the Society for the Promotion of Engineering Education who will desire certificates to attend the meetings of this society *only* is small and it has not yet been arranged to secure special rates for them, except from points on the Grand Trunk or on the Canadian Pacific railroads, where a two-thirds return rate can be had by securing certificates.

The papers, etc., are: President's address, "The Scope and Relative Importance of Theoretical Study," Henry T. Eddy.
"Methods of Teaching: by Text-Book, by Lecture, by Design, by Laboratory, by Memoir," W. H. P. Creighton.
"The Teaching of Machine Design," J. J. Flather.
"The Calculus for Engineering Students," F. W. McNair.
"The Influence of Scientific Research upon the Development of Chemical Technology," H. Runte.
"Chemical Engineering," J. M. Ordway.
"The Efficiency of Technical as Compared with Literary Training," T. C. Mendenhall.
"A Course in French and German for Engineers," A. N. Van Daell.
"At What Point Should Students Engage in Specific Research and How Much Aid Should They Receive from the Professor?" C. D. Marx.
"Mining Vacation Field Work," F. W. Denton.
"To What Extent Should Metallurgy be Taught in Mechanical Engineering Courses?" M. E. Cooley.
"Engineering Laboratory Courses," R. C. Carpenter.
"Elective Studies in Technical Courses," H. L. Munroe.
Report of Special Committee on "Uniformity of Symbols," Ira O. Baker, Chairman.
"Manual Training for Artisans," C. M. Woodward.
"Manual Training in Public High Schools," T. W. Mather.
Report of Special Committee on "Entrance Requirements," F. O. Marvin, Chairman.
"Graduation Theses: Their Preparation, Form and Preservation," Ira O. Baker.
"Agricultural Colleges: Their Function with Relation to Engineering," C. S. Murkland.
"The Education of the Electrical Engineer," W. E. Ayrton.
"A Course of Study in Electrical Engineering," R. B. Owens.

PERSONAL.

—Mr. F. Hoppe, Freight Auditor of the Chicago Great Western, died in St. Louis July 28.

—Mr. Edward M. Stewart, C. E., has been appointed Chief Engineer of the Dominion Atlantic.

—Mr. W. C. Squire has entered the service of the Atchison, Topeka & Santa Fe as Mechanical Engineer.

—Mr. A. J. Mentow has been made Master Mechanic of the Oconee & Western, with headquarters at Dublin, Ga.

—Mr. Newton Haight, Traveling Passenger Agent for the Union Pacific, died at St. Louis Aug. 2, aged 59 years.

—Mr. W. J. Jeffery has been appointed General Agent of the Denver & Rio Grande at the company's new office in St. Louis.

—Mr. Jesse Frey has been appointed General Manager of the San Antonio & Gulf, to succeed Mr. George Dullnig, resigned.

—Mr. Thomas Lee, for several years General Roadmaster of the Rio Grande Western, was recently killed while riding on an engine.

—Mr. William McKenney, for many years a director of the Queen Anne's & Kent Railroad, died at his home in Centreville, Md., July 23.

—Mr. Channing M. Ward has been appointed General Manager for the receiver of the South Atlantic & Ohio, with headquarters at Bristol, Va.

—Mr. J. Campbell, Master Mechanic of the Lehigh Valley at Buffalo, has been placed in charge of the car department of the Buffalo Division.

—Mr. John Lehane has been appointed Commercial Agent for the St. Louis Southwestern at Houston, to succeed Mr. John W. Tate, resigned.

—The headquarters of Mr. Fred H. Jones, District Passenger Agent of the Cotton Belt, have been removed fram Atlanta, Ga., to Memphis, Tenn.

—Mr. P. Griffin has been appointed Superintendent and Purchasing Agent of the Dominion Atlantic at Halifax, in place of Mr. K. Sutherland, resigned.

—Mr. R. W. Bryan has been appointed Assistant General Superintendent of the Great Northern in the Western District, to succeed Mr. O. O. Winter, resigned.

—Mr. William L. Tarbet has been appointed Consulting Engineer of the Illinois Railroad & Warehouse Commission, to succeed Mr. Dwight C. Morgan. resigned.

—Mr. L. E. Eaton, for some time Chief Clerk to Superintendent W.M.Corbett,of the Evansville & Terre Haute, has been appointed Traveling Freight Agent for that road.

—Mr. A. P. Hall, of Ogden, Utah,has been appointed Superintendent of Terminals for the Atchison, Topeka & Santa Fe, in Kansas City, to succeed Mr. J. W. Starr.

—Mr. C. W. Galligan, Assistant General Freight Agent of the St. Louis, Chicago & St. Paul, has been made General Freight Agent, with headquarters at St. Louis, Mo.

—Mr. N. Frey, General Foreman of the locomotive repair shops of the Chicago, Burlington & Northern, La Crosse, Wis., will have charge of the work of Mr. W. H Lewis, resigned.

—Mr. Robert C. Haase, Ticket Agent for the Baltimore & Ohio at Bellaire, N. C., has been promoted to the position of Traveling Passenger Agent, with headquarters at Newark, O.

—Mr. E. A. Williams, Assistant General Passenger Agent of the St. Louis, Chicago & St. Paul, at St. Louis, Mo., has been appointed Assistant General Freight Agent in place of Mr. C. W. Galligan.

—Mr. Onward Bates, Engineer and Superintendent of Bridges and Buildings of the Chicago, Milwaukee & St. Paul, has had conferred upon him the degree of Civil Engineer by the University of Wisconsin.

—Mr. Alexander Grant, Chief Clerk of the United States Railway Mail Service, has been appointed Assistant General Superintendent of that service to succeed Mr. Lilburn T. Myers, of Virginia, resigned.

—Mr. R. G. Collins, Jr., formerly connected with the Engineer Corps of the Duquesne Traction Co., has been appointed Roadmaster over 150 miles of the Wisconsin Central, with headquarters at Ashland, Wis.

—Mr. David Brown, Jr., Ticket Agent of the Grand Trunk in New York City, has been made Traveling Passenger Agent of that road, to succeed Mr. W. R. Jaffray, with headquarters at St. Paul, Minn.

—Mr. R. H. Soule, who recently resigned the position of Superintendent of Motive Power on the Norfolk & Western Railway, has accepted an engagement with the Baldwin Locomotive Works, beginning Aug. 1.

—Mr. W. W Wheatly, formerly of the West Shore, and for the last year or so on the Brooklyn Heights (electric street) road, of Brooklyn, N. Y., has been promoted to be Assistant General Superintendent.

—Mr. C. N. Woodward, for 15 years Chief Train Dispatcher of the New England road, has been promoted to the office of Assistant Superintendent of the Eastern Division of that road, with headquarters at Boston.

—Mr. A. M. Parker has been appointed Supervisor of Division No. 21 of the Pennsylvania, to succeed Mr. A. J. Whitney, Jr., who has been appointed Supervisor of Division No. 31, in place of Mr. Jesse Yarnall, deceased.

—The officials of the Huntingdon & Broad Top Mountain have presented the retiring General manager, Col. George F. Gage, with a silver set of 129 pieces as a testimonial of their appreciation of his long and faithful service.

—Mr. Don A. Sweet, formerly General Freight and Passenger Agent of the Atlantic & Pacific, at Albuquerque, N. Mex., has been appointed General Agent of the Atchison, Topeka & Santa Fe, at El Paso, Tex., to succeed Mr. E. Copland, resigned.

—Colonel Henry S. Haines, late Commissioner of the Southern States Freight Association, and formerly Vice-President of the Plant System and President of the American Railway Association, is going to Europe for a stay of indefinite length. He will sail from New York on Aug. 19.

—Mr. Morris Williams, formerly Superintendent of the Mineral & Mining Co., at Shenandoah, Pa., has been chosen successor to Major Irving A. Stearns as Manager of the Susquehanna Coal Co. and the other interests of the Pennsylvania Railroad at Wilkes-Barre. He assumed charge Aug. 1.

—Mr. Charles Watts, General Superintendent of the Northwest System of the Pennsylvania Lines West of Pittsburgh, has gone to Europe for the benefit of his health, which has been bad for several months. He was accompanied by Mr. W. W. Branson, a conductor of the New York Division of the Pennsylvania.

—Dr. C. M. Drake, for several years Chief Surgeon of the Southern, has resigned and will resume private practice. Dr. Drake was with the East Tennessee, Virginia & Georgia for several years, until it became absorbed into the Southern. Eighteen months ago he was made Chief Surgeon of the entire system.

—Mr. David Sloan, Assistant Chief Engineer, has been appointed Chief Engineer of the Illinois Central Railroad, in place of Mr. J. F. Wallace, resigned. His successor will be Mr. Dwight C. Morgan, of Dwight, who retires as Consulting Engineer to the Illinois State Board of Railroad & Warehouse Commissioners on Aug. 11.

—Mr. John M. Savin has been made General Manager of the Omaha, Kansas City & Eastern, the new consolidated line from Quincy, Ill., to Omaha, Neb. Mr. Savin was born at Baltimore, Md., in 1854. He entered railroad service about 25 years ago as Clerk in the Auditor's office of the Baltimore & Ohio. Since that time he has held positions as Traveling Auditor and Freight Agent of the Chicago, St. Paul, Minneapolis & Omaha, Assistant Auditor of the Wisconsin, Iowa & Nebraska at Des Moines and Auditor of the Quincy, Omaha & Kansas City.

—Mr. S. K. Hatah, M. E., Chief Mechanical Engineer, and Mr. Masanari Oka, District Traffic Manager of the Imperial Railways of Japan are in New York City, where they will remain for the next two or three weeks, and then go to Europe. Mr. Hatah is investigating the methods of building and maintaining railroad rolling stock in this country and in Europe, and on his return to Japan will make a report upon which will depend the buying of considerable rolling stock and machinery. Mr. Oka is studying modern methods of handling freight and passenger traffic.

—Mr. James M. Boon, who was in charge of the locomotive department of the shops of the West Shore Railroad, at Frankfort, N. Y., has retired from railroad service in consequence of the abandonment of the shops at that place by the railroad company. Mr. Boon is now in advanced years, and the Brotherhood of Locomotive Engineers at Syracuse, on his retirement, passed resolutions expressing the esteem of the members for Mr. Boon. He is one of the best known veterans of the mechanical railroad world, having been a member of the Master Mechanics' Association since 1869. He was formerly on the Pittsburgh, Fort Wayne & Chicago and later on, the Chicago & Northwestern, but has been with the West Shore about 10 years.

ELECTIONS AND APPOINTMENTS.

Aroostook Northern.—At a meeting of the stockholders of this road, whose incorporation was noted in these columns on July 23, the following officers and Directors were elected: President, Albert A. Burleigh; Vice-President, Parker P. Burleigh; Treasurer, Preston N. Burleigh. Directors: Albert A. Burleigh, Parker P. Burleigh, Preston N. Burleigh, Everett E. Burleigh and Harry R. Burleigh.

Atchison, Topeka & Santa Fe.—By joint arrangement with the California Southern this company has made the following changes in the management of the Santa Fe Pacific, which has come under its control. The position of Assistant General Freight and Passenger Agent at San Francisco is abandoned. H. C. Bush becomes General Agent of the freight department and John L. Truslow General Agent of the passenger department, with headquarters in San Francisco. T. A. Jones is appointed General Agent of the freight and passenger departments, with headquarters at Santa Barbara, Cal. The jurisdiction of H. K. Gregory, Assistant General Passenger Agent of the Southern California, is extended over the Santa Fe Pacific.

Chicago Great Western.—A new operating arrangement has gone into effect on this line, whereby Assistant General Superintendent J. Burlingett, formerly at St. Paul, Minn., will have headquarters at Oelwein, Ia., with the title of Superintendent of Transportation. A number of offices of Division Superintendents have been abolished, and those now holding those offices will be located as follows: J. C. Ford will remain at Oelwein as Assistant to the General Superintendent; J. A. Kelly, of Chicago, will go to St. Paul, as Assistant to the General Superintendent, and B. F. Egan, of Des Moines, Ia., will become agent at St. Joseph, Mo.

Denver & Rio Grande.—This company has established a general agency in St. Louis, taking effect Aug. 1. Mr. W. J. Jeffery, brother of the President and General Manager, is to act as General Agent of the company at that place.

Dominion Atlantic.—A number of changes have been made in the general officers of this road. The resignation of Mr. K. Sutherland as Superintendent went into effect July 31, and Mr. P. Griffin has been appointed to the position. Mr. Edward M. Stewart, C. E., has been appointed Chief Engineer. Mr. Fred M. Morey, Chief Clerk, has resigned.

Grand Trunk.—The following changes went into effect Aug. 1: Mr. John Pullen is appointed Division Freight Agent, with headquarters at Hamilton, and will have charge of that portion of the Middle Division south of the main line between Weston and Point Edward, and including that portion of the Northern Division between Stewarton and Hamilton, vice Mr. R. Quinn, assigned to other duties. Mr. Frank J. Watson is appointed Division Freight Agent, with headquarters at Stratford, and will have charge of that portion of the Middle Division between Weston and Point Edward, inclusive, and lines north thereof.

Illinois Central.—The recently purchased Ohio Valley has been made a part of the Illinois Central, to be known as the Evansville District of the Louisville Division. L. A. Washington has been appointed Assistant Superintendent in charge of the district, with headquarters at Henderson, Ky. J. S. Weitzell has been made Assistant General Freight Agent, with headquarters at Evansville Ind.

Preston.—The names of the incorporators of this road, whose incorporation is noted in another column, are as follows: W. R. Butler, Mauch Chunk, Pa., R. P. Crellin, White Haven, Pa.; H. J. Frear, George W. Fleming, T. J. Petticord, Oakland, Md.

St. Louis, Chicago & St. Paul.—By a change which has recently gone into effect at St. Louis, Mr. C. W. Galligan, Assistant General Freight, has been made General Freight Agent, and Mr. E. A. Williams, Assistant General Passenger Agent, has been appointed Assistant General Freight Agent, to succeed Mr. Galligan.

San Francisco & San Joaquin Valley.—At the annual meeting of the Board of Trustees, held at San Francisco, July 20, the following officers and additional directors were elected: President, Claus Spreckels; First Vice-President, Robert Watt; Second Vice-President, A. H. Payson; Secretary, Alexander Mackay. Directors: Charles Holbrook, J. D. Spreckels, J. B. Stetson, Leon Sloss, Thomas Magee, Isaac Upham, A. Hayward and J. A. Cooper.

Southern.—At a meeting of the stockholders held July 29 the following Board of Directors was elected for the ensuing year: Samuel Spencer, Josiah F. Hill, M. A. Moslin, A. B. Anderson, Francis Lynde Stetson and W. W. Finley.

Southern Pacific.—The directors of this company met at San Francisco July 30 and elected George Crocker a Director to fill the vacancy caused by the death of his brother, Colonel C. F. Crocker.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Alaska Road.—A correspondent from Wilmington, Del., writes that the Yukon Mining, Trading and Transportation Company has commenced operations for a railroad into the new gold fields. Prof. William A. Pratt, of Delaware College, formerly chief engineer of the Philadelphia & Baltimore Division of the Baltimore & Ohio, and Mr. P. I. Packard, who has spent many years in Alaska, left Wilmington, July 25, for Juneau, Alaska, with a party of engineers to make a survey of the proposed route. The proposed road will start at the head of Taku Inlet, about 20 miles south of Juneau and follow the north bank of the Taku River through the mountains, about 65 miles. From that point a cut will be made across the country to the head of Teslin Lake, making the whole road about 150 miles long. From Teslin Lake steamers of the company will connect with Dawson City and other points on the Yukon. The Yukon Mining, Trading and Transportation Company is chartered under the laws of West Virginia and British Columbia with capital stock of $3,000,000. The estimated cost of building the railroad is $1,500,000. The Canadian Parliament has given the company a land grant of 750,000 acres, which includes valuable quartz deposits near Teslin Lake. Among those interested in the company at Wilmington are Willard Saulsbury, lawyer and financier; Preston Lea, President of the Union National Bank, and C. F. Hutchins, Manager of the City Railway Company.

Alexandria, Junction City & Shreveport.—This company has been incoporated by stockholders of the Arkansas Southern to extend that road from Junction City, Ark., south through Lousiana to the Gulf of Mexico. C. C. Henderson, General Manager, at Junction City, writes that preliminary work is now being done.

Canadian Pacific.—The first 100 miles from Lethbridge, B. C., of the new Crow's Nest Pass road are now under contract. Contracts for the first 50 miles were let in July, and work is being pushed rapidly. The second 50-mile division has been divided into sections of from 5 to 10 miles in length and awarded to Messrs. McArthur, Buchanan, Strevel, Keith and Bowels, all of Winnipeg; McGillvery, of Vancouver, and Hugh Mann, of Rossland. The completed road is to extend from Lethbridge west 330 miles to Nelson, B. C.

Carolina & Northwestern.—Col. G. W. F. Harper, President of this company, states that the management has decided to substitute 50-lb. steel rails for the present iron and steel rails over the entire main line, which extends from Lenoir, N. C., south about 107 miles to Chester, S. C. Orders will be placed early in the fall. It has also been decided to build 10 miles of track between Newton and Hickory, N. C., to fill a gap in the line where trains are now run over the track of the Western North Carolina Division of the Southern. This road was under a receiver for two years prior to January, 1897, when it was reorganized and its name changed from the Chester & Lenoir to the present form.

Chester & Becket.—This short Massachusetts railroad, begun about a year ago, is nearly completed and will probably be ready for business about Oct. 1. It is about 5¼ miles long, and has been built to connect various granite quarries with the Boston & Albany at Chester. The Hudson & Chester Granite Co., the Boston & Albany Railroad and the towns of Chester and Becket are the principal owners. The grading has been done by Vandegrift & Jacobs, of Philadelphia. The country is very rough and on a part of the line the grade is five per cent.

Erie.—J. C. Moorhead, General Superintendent of the Ohio Division of the Erie road, writes that no surveys have been made by his company for an extension of the Lisbon & Ohio branch to East Liverpool, as reported by local newspapers.

Fort White & Southern.—Surveys have been made to extend this road from Blue Sink Mines south through Alachua County to Trenton, Fla. The work is to be pushed as the requirements of the company demand. This road now extends from Fort White, on the Savannah, Florida & Western, to Blue Sink Mines, six miles

Illinois Central.—This company took formal possession, July 29, of the Ohio Valley. The road was bought by the Illinois Central, July 13, for $1,050,000, the upset price fixed by the Court. It extends from Hopkinsville, Ky., to Evansville, Ind., 130 miles. It will be operated as the Evansville District of the Louisville Division.

Kansas City, Osceola & Southern.—This company has engineers in the field making preliminary surveys for an extension of its road from Osceola, Mo., southeast about 35 miles to Bolivar.

Laurel & Northwestern.—This company is at work upon an extension of its road which, when completed, will extend from Laurel northwest through Jones and Smith counties to Raleigh, Mo. Ten miles are now in operation and about 10 more will be completed within 12 months.

New Roads.—The Enterprise Land & Improvement Co., of Raleigh, N. C., now has a charter to build a railroad from a point near South Pines, N. C., on the Seaboard Air Line, southeast about 40 miles to the mouth of the Rock Fish Creek at the Cape Fear River.

Plans are being considered for building a railroad from Bowling Green to Leitchfield, Ky., a distance of about 50 miles. T. O. Rawlings & Co., Louisville, Ky., write that all the preliminary work for this line has been done and that active building will begin Sept. 1.

Paragould Southeastern.—Surveys have been made for an extension of this road from its present terminus at Cardwell, Dunklin County, Mo., east 10½ miles to Hornersville, head of navigation at Big Lake. This road at present extends from Paragould, Ark., a point on the St. Louis Southwestern, east to Cardwell, Mo., 11 miles. The new extension will connect with the water route through Pascola River to the Mississippi.

Preston.—This company has been incorporated in Maryland to build a road from Hutton, Md., a point near the Western state line on the Baltimore & Ohio, southwest through Preston County, W. Va., to Aurora, eight miles. About three-fourths of the road is now completed. It extends through a timber and coal country. The names of the incorporators will be found in another column.

Queen Anne's.—The contract for the last section of this road has been awarded to Messrs. Wade, Burns & Co., of Baltimore. When completed the road will extend from Queenstown, Md., east about 90 miles to Rehoboth, Del., on the Atlantic Ocean. About 80 miles, from Queenstown to Milton, Del., has been completed.

St. Louis, Caruthersville & Memphis.—This company was chartered in Missouri, July 23, with a capital of $210,000, to build a line from Caruthersville southwest to the state line between Arkansas and Missouri, 21 miles.

Sebasticook & Moosehead.—Two extensions of this road are now under consideration requiring the expenditure of $600,000. One extension is from Hartland, the present northern terminus, north to Guilford, Me., a point on the Bangor & Aroostook, about 20 miles. Another proposed extension is south from Pittsfield to Burnham, Me., about 10 miles. This southern extension would be narrow gage and would be a connecting link with the Wiscasset & Quebec, which according to reports is to be consolidated with this road.

Shreveport & Red River Valley.—This company has been incorporated to build a line from Shreveport south along the Red River Valley to Coushatta, La., about 50 miles. Among those interested are William Beenborn, President of the White Cliff Cement Co., Chicago; George W. Fouke, of Texarkana, Ark., and W. C. Taylor, of Shreveport, La. The headquarters of the new company are at Shreveport, La.

Southern.—This road is relaying 25 miles of track between Wauhatchie, Tenn., and Ft. Payne, Ala., with 75-lb. rails.

Watauga Mineral.—This company has been chartered in Tennessee to build a road from the North Carolina state line west to Stony Creek, Tenn., and along the the Stony Creek Valley to Watauga River, about 40 miles. The incorporators are John W. Adams, J. T. Tipton, J. H. Alexander, Lee F. Miller, L. H. Anderson, of Elizabethton, Tenn.

Electric Railroad Construction.

Boston, Mass.—The Norfolk Suburban Street Railway Co. has petitioned the selectmen of Dedham, Mass., for the right to extend its tracks from the present terminus on Washington street, Dedham Center, into and across High street and into and along Memorial Square east of the drinking fountain.

Charleston, S. C.—The Charleston Electric Street Railway Co., which was formed last February by a consolidation of all the street car lines of Charleston, has asked authority from the City Council to extend its line from Spring street to a point outside of the city, known as New Bridge. It is expected that work will begin this month.

Cleveland, O.—All the track of the Lorain & Cleveland electric road has been finished, except the connections with the street railroads at each end of the line. The power-house is finished and the power plant is to be put in within a few days. It is expected that the line will be in operation some time during September. The road extends from Cleveland west to Lorain, about 25 miles, passing through Rocky River.

The Cleveland, Painesville & Eastern Railroad has obtained entire right of way for its proposed extension from St. Clair street to Collinwood, two miles, passing through the Shumway Gully.

Collegeville, Pa.—The Collegeville Electric Street Railway Co. has been incorporated in Pennsylvania, with $7,000 capital stock, to build a line 1⅛ miles long in this town. It is expected that the road, when built, will be leased or sold to the Schuylkill Valley Traction Co., one of whose lines from Norristown runs to Collegeville.

Colorado Springs, Col.—The City Council has given a franchise to Irving Howbert and others for an electric road to be built between this place and Cripple Creek. It is reported that the company also has the right to take power from the city's water system. Grading on the line, which will be about 30 miles long, was begun July 28.

Connellsville, Pa.—An extension of the Connellsville, New Haven & Leisenring Passenger Railway, an electric line, is proposed to Vanderbilt and Uniontown, Pa., two routes being under consideration, one from Leisenring and the other from Trotter, Pa. In either case the line will be run over coal lands owned by W. J. Rainey and the H. C. Frick Coke Co.

East St. Louis, Ill.—The City Council has recently passed an ordinance grantiug a franchise to the East St. Louis Electric Railroad Co. for a line in this city. Julius S. Walsh is President of the company.

Flint, Mich.—At a recent meeting of capitalists of this town it was decided to build an electric road from Flint south to Long Lake and Fenton, about 16 miles. It is said that right of way for the line has already been obtained. The local committee is represented by George Durand, W. C. Durand, George Buckingham, William C. Lewis and H. C. Spencer.

Greene County, N. Y.—Four companies were incorporated at Albany, July 28, with the same interests behind each, to build electric roads in Greene County, N. Y., and vicinity as follows: The Coxsackie & Greenville Traction Co. will build a road from the terminus of the Greene County Traction Co.'s line in Coxsackie to a point on the boundary line between Greenville and Durham, about 12 miles; the company's capital stock is $150,000. The Oak Hill Traction Co. will build a road 20 miles long, from the terminus of the above line, at Durham, to Oak Hill, Conesville, East Durham and Cairo, in Greene County; the company's capital stock is $250,000. The third company, to be known as the Middleburg & Oak Hill Traction Co., will build from a connection with the above road at a point near Rensselaerville, Albany County, through Rensselaerville and Broome, to Middleburg, Schoharie County, about 25 miles; the company's capital stock is $300,000. The fourth company, the Windham Traction Co., will build from a point on the Oak Hill Traction Co.'s line, near Durham, through Manor Hill, Schoharie County, Windham, Ashland and Hansonville, to a point near Butt's Hotel, in Durham; the capital stock is $250,000. Among those interested in all of these companies are William G. Raines, T. E. Smith, W. F. Leland, W. S. Smith, M. E. Ingersoll, P. Anderson, E. Richter and Albert A. Lasson, all of New York City, and George C. Spencer, of Chicago. The principal office of the companies will be in New York City.

Greensburg, Pa.—The Greensburg & Mount Pleasant Electric Street Railway Co. has recently been chartered in Pennsylvania, to build a road nine miles long from South Greensburg, south through Titusville to Mount Pleasant. The capital stock is $75,000. W. F. Sadler, of Carlisle, Pa., is President.

Kankakee, Ill.—The Kankakee, Wilmington & Morris Electric Street Railway Co. was incorporated in Illinois July 26 with a capital stock of $50,000. It is proposed to build and operate an electric road between this city and Wilmington. The incorporators are: Frank B. Handwork, Thomas J. Divens, of Chicago; August D. Ehrick, of Kankakee, J. A. Henry, Joliet, Ill.; Cyrus L. Bennett, Philip L. Cromwell and J. L. Lins, Wilmington, Ill. The company's principal office will be in Wilmington.

Knoxville, Tenn.—A contract for first mile of the extension of the Knoxville Street Railroad from Knoxville to Galesburg, has been given to H. B. Krotter, of Knoxville, who has begun work. The road is now about 13 miles long.

Lexington, Mass.—A company has recently been organized at this place and will apply for a charter within a few days to build an electric road from the terminus of the West End at Arlington Heights to North Lexington and from the center of the town to Woburn, in all 15 miles. The company's capital stock will be $150,000.

Milwaukee, Wis.—The Milwaukee Traction Co. has recently been incorporated with a capital stock of $2,500,000 to build, maintain and operate street electric roads at this place and to generate and store electric power.

It is reported that the Milwaukee Electric Railway & Light Co. proposes spending $700,000 in improvements. Of this $500,000 will be spent in enlarging the River Street power house and $200,000 in building the extension to Waukesha. The company was incorporated in January, 1896, to succeed to the property and franchises of the Milwaukee Street Railway Co., sold under foreclosure at that time. The total track in May, 1896, was 133⅓ miles, all operated by electricity, except one branch of five miles to White Fish Bay. The company's capital stock outstanding is $7,000,000, of which $3,500,000 is preferred, the remainder being common stock.

Montoursville, Pa.—The Tennis Construction Co. E. A. Tennis, President, has the contract for building the Montoursville Passenger Railway, which is proposed to connect Montoursville with Williamsport, about 5 miles, and has begun work. J. W. Cramp, of Montoursville, is Superintendent of the railroad company.

New London, O.—The Huron County Commissioners have given a franchise to the Tri-City Interurban Electric Railway Co. for that portion of its line which will pass through Huron County. The road is proposed from Ashland, in Ashland County, north about 15 miles to New London.

New York.—Gen. C. H. T. Collis, Commissioner of Public Works, has given a permit to the Metropolitan Street Railway Co. to change the motive power of the Fourth avenue surface road from horse to electricity, from the southern end of Centre street to the northern end of the line in Harlem. The company has also filed plans with the Commissioner of Public Works for substituting electricity as motive power on its line in Park Row, which plans were opposed by the Third avenue cable road. A decision on the application for changing the motive power on this part of the line was accordingly reserved until the protest of the Third avenue road has received further consideration. Work on the Metropolitan Street Railway Company's line on Madison avenue was begun north of Eighty-eighth street Aug 2, all northbound cars being switched back from that point and passengers for points north being transferred to the Lexington avenue cable cars, two blocks east. On Aug. 4 General Collis gave a permit to the same company to change the motive power to electricity on the Twenty third street and Fifty-ninth street cross town lines.

Philadelphia.—The Philadelphia & Merion Railway Co., which was recently incorporated to build and operate an electric road on the Philadelphia, Bala & Bryn Mawr turnpike from Jefferson street to Overbrook avenue, in the Thirty-fourth Ward, has filed a petition in the Common Pleas Court asking that a jury of five be appointed to assess damages for the occupation of the property of the turnpike company, with which the railroad company has as yet been unable to make an agreement. The ordinance giving the company the right to lay tracks was passed July 14.

Schuylkill Haven, Pa.—The extension of the electric road to Schuylkill Haven has reached a point on St. John street, and connection has been made with the line to Spring Garden, at the point where it first touches this town. It is expected that the road will be finished by Sept. 15. All bridge work is being done under contract, the remainder of the line being built by the company.

Springfield, Mass.—The Springfield Street Railway Co. is to build a new line to Forest Park, crossing the watershop pond. Permission has just been received from the Secretary of War to cross the goverment property at the Armory, and work will be begun at once.

Syracuse, N. Y.—The Rapid Transit Co. has filed acceptance of the extension franchise (and consequent obligations) which was passed over the Mayor's veto by the Common Council July 20. The franchise provides, among other things, that after Jan. 1, 1906, the company shall pay into the Syracuse City Treasury one-quarter mill for each fare collected from passengers on the lines then operated by the company, said amount to be paid on the first day of January each year.

Tonawanda, N. Y.—At a recent meeting of the Tonawanda Board of Trustees the village attorney was directed to notify the Buffalo, North Main Street & Tonawanda Railway Co. that the franchise given to that company May 26, 1896, for a second track would be forfeited and annulled unless work was begun on the line within 10 days from serving the notice. It is expected that the railroad company will begin work at once.

Washington, D. C.—The extension of the Brightwood Railway from Silver Spring north to Forest Glen, Md., is nearly completed. It is said that the company proposes a further extension of the line from Forest Glen north through Kensington to Rockville, Md., a total of about 11 miles. The company now operates 5⅛ miles of road between Washington and Silver Spring.

Surveys are now being made for a proposed extension of the Washington, Arlington & Falls Church Electric Road from Arlington southwest through Fairfax County to the Theological Seminary near Fairfax Court House.

West Chester, Pa.—It is expected that the extension of the Philadelphia & West Chester electric road from Newtown Square to West Chester will be finished before winter. The road will pass through the town of Castle Rock, which is to be fitted up as a pleasure resort. The company now operates 12¼ miles of road laid with 60-lb. rails. John N. M. Shimer is President.

White Plains, N. Y.—It is reported that a syndicate of Philadelphia capitalists has bought the New York, Elmsford & White Plains Electric Road and will proceed at once to carry out the plan of the local company, which is to connect White Plains with Tarrytown and Mamaroneck and Rye, on Long Island Sound. It is also reported that William D. MacQueston, of Mt. Vernon, has the contract for building the extension to Tarrytown.

Worcester, Mass.—Messrs. Charles E. Dresser and A. S. Paton, who are interested in building the Clinton & Worcester electric road, have announced that the selectmen of Shrewsbury, Mass., have given the company a franchise permitting it to build through that town. The road is to extend from Worcester northeast to Clinton, via Shrewsbury.

Youghiogheny, Pa.—The City Council of Versailles has passed an ordinance giving right of way through that borough to the Youghiogheny Valley Railway Co. The company proposes building an electric road from McKeesport to West Newton, and now has right of way for nearly all of that distance.

GENERAL RAILROAD NEWS

Atchison, Topeka & Santa Fe.—The earnings for June and for the year ended June 30 were as follows:

	1897.	1896.	Inc. or Dec.
Gross earn.	$2,442,052	$2,148,775	I. $293,277
Oper. expen.	2,042,395	1,720,591	I. 321 804
Net earn.	$399,657	$425,184	D. $28,525
Taxes and rentals.	135,677	157,160	D. 21,483
Balance.	$263,980	$271,024	D. $7,044
Gross earn.	30,621,230	28,999,598	I. 1,621,632
Oper. expen.	22,867,189	22,071,276	I. 795,913
Net earn.	$7,754,041	$6,928,322	I. $825,719
Taxes and rentals.	1,877,984	1,930,808	D. 52,824
Balance.	$5,876,057	$4,997,514	I. $878,543

Atlantic & Pacific.—A bill has been filled in the United States Court against this road and the American Loan & Trust Co., of Boston, for the foreclosure of the first mortgage of £2,794,000 on the Central Division of the road extending from Seneca, Mo., to Sapulpa, I. T., 112 miles. The suit also involves $1,823,000 of second mortgage bonds of the same trust company. This action is taken as a purely formal proceeding to clear up the title.

Baltimore & Ohio.—Judges Goff and Morris, in the United States Circuit Court at Baltimore, Md., July 29 decided that the right to a six per cent. dividend on the $3,000,000 first preferred stock is not a first lien upon the company and the dividend need not be paid out of the gross profits. Of this stock $981,115 is owned by John Hopkins University, which will lose annual dividends of over $50,000. The stock owned by the University was originally issued to the state of Maryland more than 50 years ago and it appears that there was some kind of a contract between the road and the state guaranteeing or conditionally guaranteeing six per cent. on the stock. "The case on behalf of the petitioner comes to this," says the Court, "that the company having covenanted to pay the state six per cent. per annum out of the profits, and having paid it for more than half a century, it has, during that time, under powers given it by its charter, borrowed money upon mortgage and made contracts for lateral branches, the annual charges upon which now consume its earnings to the extent that there are at this time no profits, and the petitioners contend that those who hold the mortgage bonds, and who owned the lateral branches, should have taken notice that the preferred stockholders had a claim for six per cent. per annum, which was entitled to be satisfied before the claims of such creditors." This claim the Court denies.

Boston & Albany.—The earnings for the year ended June 30 were reported as follows:

Year:	1897.	1896.	Inc. or Dec.
Gross earn.	$9 111,625	$9,350 632	D. $236,007
Oper. expen.	6.658,075	6,911,865	D. 253,790
Net earn.	$2,456,550	$2,438.767	I. $17,783
Charges.	2,415,980	2,415,980	.....
Surplus.	$40,570	$22,787	I. $17,783
Total surplus.	245,405	204.836	I. 40,569

Buffalo & Susquehanna.—The following first mortgage bonds of this company will be redeemed at par with accrued interest on Oct. 1, 1897, upon presentation to Harvey Fisk & Co., 31 Nassau street, New York City; Series A $1,000 bonds Nos. 1,297 to 1,345 inclusive, Nos. 1,358 to 1,382, inclusive; Series B $500 bonds Nos. 122 to 228, inclusive.

Canadian Pacific.—The earnings for June and for the six months ended June 30 were reported as follows:

June:	1897.	1896.	Inc. or Dec.
Gross earn.	$2,000,577	$1,667.221	I. $333,356
Oper. expen.	1,114.150	1,043,217	I. 71,933
Net earn.	$886,127	$624,004	I. $262,123
Six months:			
Gross earn.	$9,712,694	$10.151,653	D. $438,959
Oper. expen.	6,042,501	7,042,716	D. 1,000,215
Net earn.	$3,670,193	$3,108,937	I. $561,256

Central of Georgia.—This company is offering a limited amount of five per cent. gold bonds, principal payable November, 1945; interest semi-annually in May and November, at $935 on each $1,000. They may be obtained at Harvey Fisk & Sons, 313 Congress street, Boston.

Chicago, Burlington & Quincy.—The earnings of this company for June and for the six months ended June 30, 1897, were as follows:

June:	1897.	1896.	Inc. or Dec.
Gross earn.	$3.022,133	$2,724,578	I. $297,555
Oper. expen.	2,070,773	1,917,357	I. 153,416
Net earn.	$951.360	$8.7,221	I. $144.139
Fixed charges.	890 000	881,107	I. 8,893
Surplus.	$61.360 (def.)	$73,886	I. $135,246
Six months:			
Gross earn.	$16,941,848	$15,592,118	I $1,349,730
Oper. expen.	10,663,154	10,595,038	I. 68,116
Net earn.	$6,278,694	$4,997,080	I. $1,281,614
Fixed charges.	5,340,000	5,286,643	I. 53,357
Surplus.	$938,694 (def.)	$289,563	I. $1,228,257

The net gains over the corresponding periods of 1896 are entirely in the freight department. The freight receipts for June, 1897, were $1,994,832, against $1,676,338 for June, 1896, a gain of $318,494. For the six months of 1897 the freight receipts were $11,555,700, against $9,971,563 in the corresponding period of 1896, a gain of $1 584,137.

Colorado Midland.—By the decree of the United States Court the sale of this road is advertised to take place under Special Master William M. McGuire at Colorado City, Sept. 8, at 12 o'clock, noon. Bidders must deposit at least $5,000 with the Receiver.

Chicago, Milwaukee & St. Paul.—The earnings for June and for the year ended June 30 were reported as follows:

	1897.	1896.	Inc. or Dec.	
June:				
Gross earn	$2,718,559	$2,604,939	I.	$113,620
Oper. expen	1,624,777	1,592,054	I.	32,723
Net earn	$1,093,782	$1,012,885	I.	$70,897
Year:				
Gross earn	$30,486,767	$32,681,827	D.	$2,195,060
Oper. expen	18,577,539	19,676,806	D.	1,099,267
Net earn	$11,909,228	$13,005,021	D.	$1,095,793

Colorado Western.—The Intermountain has been re-incorporated under the above name with a capital of $500,000. The incorporators are Charles W. Mackay, New York; J. I. Blair, Greenville, Pa.; E. C. Thomson, Meadville, Pa.; T. S. Waltmeyer and F. M. Beach.

Erie.—The earnings for June and for the year ended June 30 were as follows:

	1897.	1896.	Inc. or Dec.	
June:				
Gross earn	$2,906,799	$2,663,491	I.	$243,308
Oper. expen	2,068,071	1,945,343	I.	122 728
Net earn	$838,728	$718,148	I.	$120,580
Year:				
Gross earn	$31,497,031	$31,645,487	D.	$148,456
Oper. expen	23,340,095	23,719,403	D.	379,308
Net earn	$8,153,936	$7,926,084	I.	$230,852

Lebanon Springs.—The Receiver of this road has been unable thus far to raise the money (about $30,000) needed to put the track in condition for the safe running of trains, and has therefore suspended all business, an order having been issued last week to withdraw all trains on the night of July 30. It will be remembered that the New York State Railroad Commissioners lately notified the Receiver that action would be taken in the courts to compel the cessation of business on the road unless extensive repairs were at once made. The road extends from Chatham, N. Y., northward 57 miles to Bennington, Vt. The line lies through a very thinly settled region. The company has been in financial distress for many years, and the present Receivership has continued since 1888.

Middle Georgia & Atlantic.—The Eatonton Branch bondholders have failed the second time in trying to annul the sale of this road to the Central of Georgia. Their bonds are guaranteed by this road and they claim that the Central of Georgia is, by the terms of the sale, wrongfully relieved from responsibility for this guarantee, so that the branch bonds will be made worthless.

Omaha, Kansas City & Eastern.—The consolidation of the Omaha & St. Louis, the Quincy, Omaha & Kansas City and the Omaha, Kansas City & Eastern, forming a continuous line from Quincy, Ill., to Omaha, Neb., 315 miles, has been effected. Receiver Barnard surrendered possession of the Omaha & St. Louis on July 29.

Pennsylvania.—The earnings for June and for the six months ended June 30 on the lines directly operated were reported as follows:

	1897.	1896.	Inc. or Dec.	
June:				
Gross earn	$5,185,335	$5,105,599	I	$79,736
Oper. expen	3,864,110	4,117,868	D.	253,758
Net earn	$1,321,225	$987,731	I.	$333,494
Six Months:				
Gross earn	$29,589 483	$30,305,275	D.	$715,792
Oper. expen	21,108,008	22.792,719	D.	1,684,701
Net earn	$8,481,475	$7,512.556	I.	$968,919

Philadelphia & Reading.—The earnings of this company for June and for the six months ended June 30 were as follows:

	1897.	1896.	Inc. or Dec.	
June:				
Railway Co.:				
Gross earn	$1,678,800	$1,778,293	D.	$99 493
Oper. expen	1,047,440	1.038.497	I.	8,943
Net earn	$631,360	$739,796	D.	$108,436
Coal & Iron Co.:				
Gross earn	$1,879,290	$2,057,589	D.	$178.299
Oper. expen	1.921,142	1,993,120	D.	71,978
Net earn. (loss)	$41.852	$64,469	D.	$106,321
Reading Co.:				
Net earn	34,744	34,744		
Total net earn	$621,252	$839,009	D.	$214,757
Fixed charges	775,000	$806 250	D.	31,250
Surplus (def.)	$150.748	$32,759	D.	183,507
Six months:				
Railway Co.:				
Gross earn	$11,137,943	$11,654,707	D.	$516,764
Oper. expen	6,594,319	6,930,790	D.	336,471
Net earn	$4,543,624	$4,723,917	D.	$180,293
Coal & Iron Co.:				
Gross earn	$10.836,350	$12,592,352	D.	$1,756,002
Oper. expen	11,484,391	13.097,415	D.	1,613,024
Net loss	$648,041	$505.063	I.	$142 978
Reading Co.:				
Net earn	$191,712	$191,712		
Total net earn	$4,087,295	$4,410.565	D.	$323.270
Fixed charges	5,425,000	5,643.748	D.	218,748
Deficit	$1,337,705	$1,233,183	I.	$103,522

Union Pacific.—Two decrees for the foreclosure and sale of this road were entered in the United States Court at Omaha, Neb., July 29. The first decree was in favor of the Dexter-Ames trustees of the first mortgage and the second decree was in favor of the United States government. The decrees order that all the property and rights of the company be sold at auction to the highest bidder at the freight-house in Omaha, on a date to be hereafter fixed and appoint William D. Cornish, of St. Paul, a special master to make the sale. The upset price for the sale under the first decree is $50,637,455. Prospective bidders are required to deposit, five days previous to the sale, $2,000,000, and the successful bidder must deposit, five days after the sale, 15 per cent of the bid. Deferred payment must be made as follows: 25 per cent. within thirty days after confirmation of the sale; 25 per cent. in forty days; 25 per cent. in 50 days and 25 per cent. in 60 days. The purchaser may pay in cash, or in cash and first mortgage bonds. The money received is to be applied to the payment of the first mortgage bonds; second, if there be a surplus, to the payment of any debt due the government. The receivers were also ordered to file within 10 days an approximate statement of the amount of money in their hands, the amount due to them and all their liabilities due from the operation of the road. The decree in favor of the United States is similar in form to the one for first mortgage bondholders, except that it provides for a sale of the property subject to the prior liens represented by the other decree. It provides for a double sale, to wit, the subsidy bonds of $27,235,512, with interest amounting to $30,525,430, making a total of $57,572,430, the upset price being $23,000,000; the other is the sale of $15,645,650 of Union Pacific sinking fund, which cannot be sold for less than par value.

Wabash.—The earnings for June and for the year ended June 30 (estimated) were reported as follows:

	1897.	1896.	Inc. or Dec.	
June:				
Gross earn	$948,577	$979,555	D.	$30,978
Oper. expen	651,779	774,689	D.	122,910
Net earn	$296,797	$204,866	I.	$91,931
Year:				
Gross earn	$11,526,422	$12,807,143	D.	$1,280,721
Oper. expen	7,979,159	9,242,605	D.	1,263,447
Net earn	$3,547,263	$3,564,537	D.	$17,274

Electric Railroad News.

Birmingham, Ala.—At a recent meeting of the stockholders of the Birmingham, Powderly & Bessemer Railroad it was voted to spend $40.000 in the proposed improvements to that property. New 60-lb. rails will be laid on nearly all of the line, new rolling stock will be bought and old rolling stock will be repaired. The new rails have already been bought and it is expected that work on the road will be begun at once. The road, which is 12½ miles long and 4 ft. 9 in. gage, was sold under foreclosure in April, 1896, and bought on behalf of the certificate holders. Pending reorganization the road is still operated by the receiver, although leased to W. F. Kennedy.

Bridgewater, Mass.—At a recent meeting of stockholders of the Bridgewater, Abington & Whitman Street Railway Co. it was voted to issue $50,000 additional stock, making the total capital stock $85,000. George A. Butman was elected Treasurer, to succeed Charles H. Wilson. The road is proposed from a point near the Old Colony station in Bridgewater, northeast through East Bridgewater, Whitman and Abington to Rockland, about 10 miles.

Brooklyn, N. Y.—Arrangements have been made for consolidating the Brooklyn City & Newtown Railroad (DeKalb avenue line) and the Coney Island & Brooklyn Railroad (Smith street line). According to the terms of the agreement the Brooklyn City & Newtown Co., whose capital stock is now $1,000,000, will issue $1,000,000 additional stock, which will be paid to the owners of the Coney Island & Brooklyn stock in exchange for their present holdings. The Brooklyn City & Newtown road, which adopted electric motive power in 1893, now operates about 9 miles of line. The Coney Island & Brooklyn Railroad is a double-track line running from Brooklyn to Coney Island, with branches, in all, 12¼ miles; its capital stock is $1,000,000 outstanding.

Chicago.—Judge Showalter gave a decree July 27 directing United States Master in Chancery Bishop to sell the Englewood & Chicago Electric Railway. The decree provides that out of the purchase price the cost of administration shall first be paid, and subsequently series "A" of Receivers' certificates amounting to $60,000 and series "B" of Receivers' certificates amounting to $265,000 and thereafter the bonds. The road, which was chartered in 1893, was placed in the hands of G. Herbert Condict, Receiver, Jan. 20, 1897. The above-named Receivers' certificates were authorized last March to pay off liens and to complete the road. The line when finished will be 13 miles long, double track, extending from a connection with the Alley "L" from South Chicago to Englewood, Harvey and Blue Island.

Detroit, Mich.—Judge Swan, of the Sixth United States Circuit Court, at Detroit, granted a preliminary injunction July 15 restraining the Detroit Citizens' Street Railway Co., from using the under-running trolley as covered by the Van Depoele patent, No. 495,443, of April 11, 1893. A preliminary injunction was also granted against the same road prohibiting it from using the suspended switch as covered by the Van Depoele patent, No. 424,695 of April 1, 1890. In both instances the railroad company was given 60 days in which to substitute non infringing apparatus.

Lewiston, Me.—On July 28 a controlling interest in the bonds of the Lewiston & Auburn Railroad was bought by a syndicate of Maine capitalists. The company has now $350,000 bonds outstanding, of which $60,000 is first mortgage. The syndicate has bought $150,000 of bonds, but no stock. It is proposed to reorganize the company and issue new bonds for the purpose of making considerable extensions of the road, the plan being to build lines from Lewiston to Brunswick, Bath, Turner and Sabattus, about 81 miles in all. The company now operates 14¾ miles of track from Lewiston to Auburn.

Racine, Wis.—A company has been incorporated by Thomas M. Kearney, E. J. Hueffner, Jackson I. Case, Frank H. Miller and G. N. Fratt to buy and operate the Belle City electric street road, which was sold under foreclosure to Frank H. Miller, July 19, for $150,000. The capital stock of the company is $200,000.

Saginaw, Mich.—Messrs. Homer Loring, of Boston, and George B. Morley, of Saginaw, have been appointed Receivers for the Union Street Railway Co., on application of the Boston Safe Deposit & Trust Co., which company also asked that a temporary injunction be issued against the city of Saginaw restraining it from disposing of the franchise. The Union Street Railway Co. has given notice of appeal to the Supreme Court. The cars of the company, which had not been run for a week previous, were put into service July 26 by the Receivers.

Tampa, Fla.—On July 26 the Central Trust Co., of New York, petitioned the United States Court for the Southern District of Florida for a Receiver for and injunction against the Consumers' Electric Light & Street Railway Co., of Tampa. It is alleged that the latter company made default in the payment of $10,500 interest on bonds due July 1 last. It is asked that the mortgage be foreclosed, and that pending the appointment of a Receiver an injunction be issued restraining the defendants from interfering with or disposing of the mortgaged property. Judge D. A. Par lee made an order commanding the defendant company to show cause as soon as counsel can be heard why a Receiver should not be appointed. The Court also issued the injunction asked for against the company.

Worcester, Mass.—The Massachusetts Railroad Commissioners have authorized the Worcester & Blackstone Valley Electric road to issue $60,000 stock, $45,000 to buy and complete the Blackstone Valley road, $8,000 to extend the road through Millbury, Sutton and Douglas, and $7,000 to buy rolling stock. The petitioners asked for authority to issue $100,000. The company was incorporated by the last legislature.

TRAFFIC.

Traffic Notes.

The new State Railroad Commission in Florida has prepared freight and passenger tariffs, and will give a hearing at Tallahassee, Aug. 25, at which all interested may present remonstrances.

The steamer George W. Elder, of the Oregon Railroad & Navigation Co., sailed from Portland, Or., for Dyea, Alaska, July 30, with 383 passengers and 1,300 tons of freight.

The Railroad Commissioners of South Carolina have reaffirmed their order of June 20, directing the railroads to make joint rates at 20 per cent. less than the sum of the local rates, and have ordered the reduction to be put in effect Aug. 20.

The low freight rates from New York to Texas points by water are still in effect, and it is said that the railroads from Chicago and St. Louis to Texas will not try to meet the competition. A St. Louis dispatch says that the merchants of that city have agreed to make to Texas buyers a discount sufficient to allow for the more favorable freight rates from New York.

An officer of the Santa Fe road in Texas tells a reporter that the reduction in cotton freight rates, which has been ordered by the State Railroad Commissioners, will, on the basis of the quantity transported last year, reduce the receipts of his road $90,000. The movement last year over that road, from Texas points, was 245,000 bales, and he estimates the average reduction in rates at 13 per cent. The merchants of Galveston are dissatisfied because the Commissioners did not make the reduction larger and because no change was made in the differential as between Galveston and Houston.

The New York *Journal of Commerce* gives a record of charters for vessels reported at New York during the month of July, to carry grain to Europe, aggregating over 21 million bushels. The number of steamers included in the list is 143, of which only 10 are positively engaged to load at New York, though in the cases of 30 others the shipper has the choice of New York, Philadelphia, Baltimore, Norfolk or Newport News. It appears that over 40 vessels, carrying over five million bushels, will load at Baltimore. Of the four million bushels to be loaded at New York nearly three millions are to go on regular steamers which carry large quantities of other freight.

The New York *Journal of Commerce* reports that practically all of the railroads bringing grain to New York from the West have made contracts for enough shipments to keep their cars busy during the next two months. No figures are given, but it is asserted that the information is from an absolutely reliable and well informed source.

The Board of Control of the Joint Traffic Association was in session several days last week, and it is said that eastbound rates were "restored"; but from the statement of the *Journal of Commerce* and the reports from Chicago, it looks as though the restoration would not take effect for at least a month.

Montana Live Stock Movement

The northern Montana stock shipping season will begin about Aug. 20, somewhat later than usual, and the number of cattle to be sent to the market will be probably slightly less than last year owing to losses during the winter, and the rather depleted condition of the young herds last fall on many ranches. In the last stock shipping season, ending at the beginning of winter, the Burlington alone shipped from the southern Montana and western South Dakota ranges 8,100 cars of cattle, valued at $6,000,000, and will probably increase the amount this year.

Chicago Traffic Matters.

CHICAGO, Aug. 4, 1897.

Excessive ticket commission payments by certain lines are causing some trouble in the Western Passenger Association. Passenger rates are considerably disturbed, roads outside of the association cutting the regular rates from $1.50 to $2.

The Illinois Central road has put in effect a rate of 10 cents on export corn from points in Illinois to New Orleans. This rate averages about 2¼ mills per ton per mile.

Commissioner Donald, of the Central Passenger Association, has ordered 50,000 thousand-mile tickets for the use of the newly created mileage bureau, which will begin business about Aug. 25.

Lake shipments are very heavy and the rates low, the prevailing price for corn to Buffalo being about 1⅛ cents a bushel.

The Erie road gave notice last week that all contract on dairy products would expire July 31 and full tariff rates would be restored. It was reported that the Nickel Plate Line gave similar notices concerning other commodities. It is said that provisions are being taken to the Atlantic seaboard in large quantities at 15 cents and some grain at 10 cents. These low rates have been guaranteed to shippers for several weeks ahead.

The grain movement into Chicago is now very heavy. All the roads are bringing in large quantities, and the receipts by the Burlington are said to be the largest in the history of the road.

The heavy percentages of Eastern freight taken by the Nickel Plate road for the last three weeks are looked upon by Board of Trade men as conclusively proving that the Joint Traffic Association agreement for the diversion of shipments in order to equalize percentages is still in force.

Eastbound shipments from Chicago and Chicago junctions to points at and beyond the Western termini of the trunk lines for the week ending July 29 amounted to 57,324 tons, as compared with 57,415 tons the preceding week. This statement includes 17,134 tons of grain, 3,287 tons of flour and 13,837 tons of provisions, but not live stock. The following is the statement in detail for the two weeks:

Roads.	Week Ending July 29.		Week Ending July 22.	
	Tons.	p. c.	Tons.	p. c.
Baltimore & Ohio	3,010	5 3	4,000	7.0
C., C., C. & St. Louis	1,641	2 9	2,130	3 7
Erie	10,555	18.4	9,244	16.1
Grand Trunk	5,728	10.0	4,907	8 5
L. S. & M. S.	5,096	8.9	4,918	8 6
Michigan Central	6,596	11.5	4,392	7.6
N. Y., Chi. & St. L.	8,050	14.0	13,909	24.2
Pitts., Cin., Chi. & St. Louis.	4,424	7.7	4,142	7.2
Pitts., Ft. Wayne & Chicago	6,312	11 0	6,981	12 2
Wabash	5,912	10.3	2,792	4.9
Totals	57,324	100.0	57,415	100.0

Lake shipments last week were 156,926 tons.